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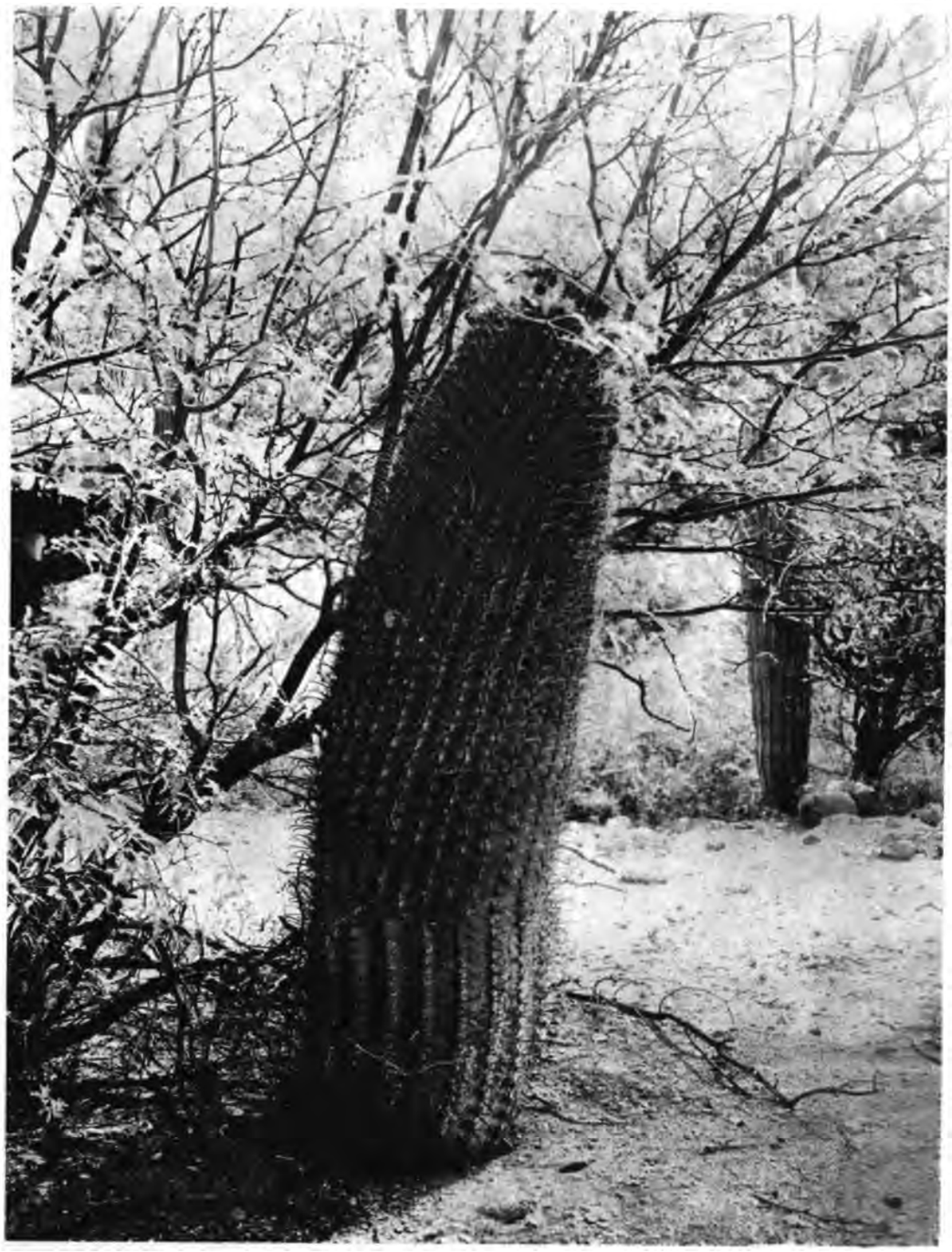

Ferocactus wislizenii.

THE CACTACEAE

DESCRIPTIONS AND ILLUSTRATIONS OF PLANTS OF THE CACTUS FAMILY

BY

N. L. BRITTON AND J. N. ROSE

VOLUME III

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THE CACTACEAE

Descriptions and Illustrations of Plants of the Cactus Family

DESCRIPTIONS AND ILLUSTRATIONS OF PLANTS OF THE CACTUS FAMILY.

Tribe 3. CEREEAE.

Subtribe 3. ECHINOCEREANAE.

Mostly low, simple or cespitose, terrestrial cacti, the stems 1-jointed or rarely few-jointed, ribbed; areoles borne on the ribs and spiniferous or rarely spineless; flowers always solitary at lateral* areoles, funnelform to campanulate; perianth-segments few to many; fruit smooth or spiny, with few exceptions fleshy and indehiscent or splitting on one side; seeds mostly black.

We recognize 6 genera, all South American except *Echinocereus*.

This subtribe, while somewhat uniform in its low, usually one-jointed stems, shows great variability in its flowers. Both *Chamaecereus* and *Austrocactus* are taken from *Cereus* of previous authors; *Echinocereus* has often been considered as a subgenus of *Cereus*. *Echinopsis* has usually been treated as a distinct genus related to *Cereus*, Bentham and Hooker, however, treating it as a subgenus of *Cereus;* in our opinion, it approaches *Trichocereus* in its flowers, but in habit resembles various genera in the *Echinocactanae*. *Lobivia* is segregated from *Echinopsis*. *Rebutia* has sometimes been recognized as a genus, but its species have usually been referred to *Echinocactus* or *Echinopsis*. The subtribe is nearest the *Cereanae*, but is also related to the *Echinocactanae*.

KEY TO GENERA.

Ovary and fruit bearing clusters of spines at areoles.
- Stigma-lobes always green; spines all straight ..... 1. *Echinocereus* (p. 3)
- Stigma-lobes red; some spines hooked ..... 2. *Austrocactus* (p. 44)

Ovary and fruit not spiny.
- Spines on tubercles as in *Coryphantha;* plants globular ..... 3. *Rebutia* (p. 45)
- Spines on ribs.
  - Plants very small, creeping, forming low clumps ..... 4. *Chamaecereus* (p. 48)
  - Plants mostly large, solitary or cespitose.
    - Flower short-funnelform to campanulate; tube short ..... 5. *Lobivia* (p. 49)
    - Flower long-funnelform; tube elongated ..... 6. *Echinopsis* (p. 60)

1. ECHINOCEREUS Engelmann in Wislizenus, Mem. Tour North. Mex. 91. 1848.

Plants always low, perennial, erect or prostrate, sometimes pendent over rocks and cliffs, single or cespitose, globular to cylindric, prostrate or pendent if elongated; spines of flowering and sterile areoles similar; flowers usually large, but in some species small, diurnal, but in some species not closing at night; perianth campanulate to short-funnelform, scarlet, crimson, purple or rarely yellow, the tube and ovary always spiny; stigma-lobes always green; fruit more or less colored, thin-skinned, often edible, spiny, the spines easily detached when mature; seeds black, tuberculate.

Type species: *Echinocereus viridiflorus* Engelmann.

The first part of the generic name is from ἐχῖνος hedgehog, doubtless given on account of the spiny fruit in which *Echinocereus* is conspicuously different from the true *Cereus*.

We recognize 60 species. Professor Schumann admitted 39 species in his monograph of 1898, while more than 190 species and varieties have been proposed by other authors.

The genus is confined to the western United States and Mexico. It extends as far east as central Texas, Oklahoma, and Kansas, north to Wyoming and Utah, west to the deserts of southern California, the Pacific coast, and islands of lower California, and south to the City of Mexico.

Echinocereus has often been combined with *Cereus*. Engelmann, as well as Berger, treated it as a subgenus of *Cereus*, but Schumann gave it generic rank. As we understand the genus, it is not close to *Cereus* proper, but is much nearer to some of the other genera.

**Echinocereus baileyi* is described as producing flowers from the young growth and appearing terminal; this habit has been observed in other species, but is inconstant.

In habit it simulates the South American genus, *Echinopsis*, while in flowers and fruits it comes near *Erdisia*, *Bergerocactus*, and *Wilcoxia*. While all the species are low in habit there is great variation in the manner and form of growth. Some are solitary; others grow in flat masses, and others in large rounded mounds. The flowers, while always having a spiny ovary and flower-tube and green stigma-lobes, have considerable variation in the shape and color of perianth-segments and in duration. The flower-buds as well as the young shoots are deep-seated in their origin and do not appear just at the areoles as in most cacti and hence must break through the epidermis when they develop. A somewhat similar result is produced in the flowering of some of the species of *Rhipsalis*. *Echinocereus* has been selected as the state flower of New Mexico.

Most plants of *Echinocereus* do not flower frequently in greenhouse cultivation.

The species are not readily grouped into series; our classification of them is largely artificial, taking flower-color as a more important character than it probably is in nature.

KEY TO SPECIES.

A. Flowers large, usually conspicuous, rarely only 2 to 3 cm. long.
  B. Stems covered with long weak bristles or hairs, resembling a small plant of *Cephalocereus senilis*. . . . 1. *E. delaetii*
  BB. Stems variously covered with spines or rarely spineless, never like the above.
    C. Flowers scarlet to salmon-colored, opening once, but lasting for several days.
      Stems usually weak, often trailing, or at least becoming prostrate; ribs nearly continuous.
        Flowers rosy red. . . . 2. *E. scheeri*
        Flowers orange-red to salmon-colored.
          Flowers 8 to 11 cm. long; wool from areoles on flower-tube long.
            Flowers 8 to 10 cm. long; radial spines 9 or fewer. . . . 3. *E. salm-dyckianus*
            Flowers 11 cm. long; radial spines 10 to 12. . . . 4. *E. huitcholensis*
          Flowers 6 cm. long or less; wool from areoles on flowers shorter than subtending scale. . . . 5. *E. pensilis*
      Stems usually erect and stout; ribs more or less tubercled.
        Plants forming large mounds, sometimes with 500 to 800 joints; spines white, long and flexuous. . . . 6. *E. mojavensis*
        Plants in much smaller clusters; spines brownish or grayish, not long and flexuous.
          Plant body with 12 to 14 ribs. . . . 7. *E. leeanus*
          Plant body with 5 to 11 ribs (in one species 12).
            Ribs 5 to 8. . . . 8. *E. triglochidiatus*
            Ribs 9 to 12.
              Axils of flower-scales filled with long cobwebby hairs.
                Flowers 5 to 6 cm. long; spines yellowish at first. . . . 9. *E. polyacanthus*
                Flowers 3 cm. long; spines reddish at first. . . . 10. *E. pacificus*
              Axils of flower-scales bearing short hairs.
                Stems elongated and thinner than in *E. octacanthus*. . . . 11. *E. acifer*
                Stems short and thicker than in *E. acifer*.
                  Stems pure green when old; central spine 1. . . . 12. *E. octacanthus*
                  Stems bluish green; central spines several.
                    Central spines 6; petals acutish. . . . 13. *E. neo-mexicanus*
                    Central spines mostly 4, sometimes 3 or 5.
                      Central spines more or less angled, somewhat curved. . . . 14. *E. conoideus*
                      Central spines terete, straight.
                        Central spines white or straw-colored. . . . 15. *E. coccineus*
                        Central spines gray to pinkish. . . . 16. *E. rosei*
  CC. Flowers broad, rotate to campanulate, opening in sunlight, closing at night, usually purple, sometimes yellow or greenish yellow, rarely pink or nearly white, unknown in *E. standleyi*.
    D. Flowers yellow or greenish white.
      Ribs not strongly tubercled.
        Plants densely cespitose. . . . 17. *E. maritimus*
        Plants usually solitary.
          Ribs very stout.
            Ribs 5 to 8; spines on flower-tube and ovary short. . . . 18. *E. subinermis*
            Ribs 8 or 9; spines on flower-tube and ovary acicular. . . . 19. *E. luteus*
          Ribs low, usually hidden by the spines.
            Flowers small, 2.5 cm. long or less.
              Areoles circular. . . . 20. *E. chloranthus*
              Areoles elliptic. . . . 21. *E. viridiflorus*
            Flowers large, 5 to 10 cm. long.
              Flowers greenish white. . . . 22. *E. grandis*
              Flowers yellow-red.

KEY TO SPECIES—continued.

Central spines in more than 1 row. . . . . 23. *E. dasyacanthus*
Central spines in a vertical row. . . . . 24. *E. ctenoides*
Ribs strongly tubercled. . . . . 25. *E. papillosus*
DD. Flowers purple.
E. Stems weak, slender, and creeping.
Stems 2 cm. thick or less.
Areoles distant; spines not interlocking.
Perianth-segments narrowly oblong or linear-oblanceolate. . . . . 26. *E. blanckii*
Perianth-segments oblong-erose. . . . . 27. *E. pentalophus*
Areoles approximate; spines densely interlocking. . . . . 28. *E. sciurus*
Stems 3 to 4 cm. thick. . . . . 29. *E. cinerascens*
EE. Stems stout, usually erect or ascending.
F. Areoles elliptic to circular, closely set, often with pectinate spines.
Areoles elliptic; spines pectinate.
Central spine often very long.
Central spine dark. . . . . 30. *E. adustus*
Central spine white. . . . . 31. *E. standleyi*
Central spine, if present, short.
Spines of ovary and tube of flower slender and weak, the surrounding hairs long and cobwebby.
Spines variegated. . . . . 32. *E. perbellus*
Spines of one color.
Spines strongly pectinate and appressed. . . . . 33. *E. reichenbachii*
Spines not strongly pectinate, more or less porrect. . . . . 34. *E. baileyi*
Spines of ovary and tube of flower short and stout, the surrounding hairs short.
Central spine none.
Stems cylindric. . . . . 35. *E. rigidissimus*
Stems globular. . . . . 36. *E. weinbergii*
Central spines present. . . . . 37. *E. pectinatus*
Areoles circular; spines not pectinate.
Central spines brown, much longer than white radials. . . . . 38. *E. fitchii*
Central spines not longer than radials.
Areoles about 5 mm. apart; spines densely interlocking. . . . . 39. *E. scopulorum*
Areoles about 1 cm. apart; spines scarcely interlocking. . . . . 40. *E. roetteri*
FF. Areoles nearly circular, not so closely set; spines never pectinate.
Ovary strongly tuberculate. . . . . 41. *E. chlorophthalmus*
Ovary not strongly tuberculate.
Flowers small, 2.5 to 5 cm. long.
Plants strongly angled; flower pinkish. . . . . 42. *E. knippelianus*
Plants not strongly angled; flower purple.
Central spines none.
Spines 3 to 5; flower-tube and ovary without long wool from the areoles. . . . . 43. *E. pulchellus*
Spines 6 to 8; flower-tube and ovary bearing long cobwebby wool from the areoles . . . . . 44. *E. amoenus*
Central spines 1 or more.
Central spine 1. . . . . 45. *E. palmeri*
Central spines several, much elongated, dagger-like. . . . . 46. *E. brandegeei*
Flowers large, 6 to 12 cm. long.
Central spines none. . . . . 47. *E. hempelii*
Central spines present.
Central spine solitary, rarely 2.
Spines red at base. . . . . 48. *E. merkeri*
Spines not red at base.
Plants stout, erect. . . . . 49. *E. fendleri*
Plants weak, becoming prostrate. . . . . 50. *E. enneacanthus*
Central spines several.
Spines never white.
Spines yellowish brown to red.
Spines short, usually stout, 10 mm. long. . . . . 51. *E. lloydii*
Spines, at least some of them, very long. . . . . 52. *E. engelmannii*
Spines bluish to blackish. . . . . 53. *E. sarissophorus*
Spines usually white or straw-colored.
Ribs 7 to 9. . . . . 54. *E. dubius*
Ribs 11 to 13.
Flowers campanulate. . . . . 55. *E. conglomeratus*
Flowers short-funnelform. . . . . 56. *E. stramineus*
AA. Flowers minute, 1.2 cm. long or less. . . . . 57. *E. barthelowanus*
AAA. Published species not grouped. . . . . 58. *E. mamillatus*; 59. *E. ehrenbergii*; 60. *E. longisetus*

1. **Echinocereus delaetii** Gürke, Monatsschr. Kakteenk. **19**: 131. 1909.

Cephalocereus delaetii Gürke, Monatsschr. Kakteenk. **19**: 116. 1909.

Low, 1 to 2 dm. high, densely cespitose, completely hidden by the long, white, curled hairs; ribs indistinct; areoles closely set, bearing 15 or more white reflexed hairs 8 to 10 cm. long and a few stiff reddish bristles; flowers appearing near top of plant; perianth-segments pink, oblanceolate, acute; stigma-lobes about 12; ovary covered with clusters of long, white, bristly spines; fruit not seen.

Type locality: Not cited.

Distribution: Known only from Sierra de la Paila, north of Parras, Mexico.

This is the most remarkable species in the genus; in aspect it resembles small plants of *Cephalocereus senilis*, and owing to this resemblance it was first described as a *Cephalocereus*. Its flowers, however, are so different from those of that genus that as soon as they were seen the plant was at once transferred to *Echinocereus*.

The plant is now largely imported into Europe and can be obtained from many dealers; it was named in honor of Frantz de Laet, a Belgian cactus dealer, who had imported many plants from Mexico through Dr. C. A. Purpus and other collectors.

Illustrations: Monatsschr. Kakteenk. **19**: 119, as *Cephalocereus delaetii*; Monatsschr. Kakteenk. **22**: 73; Rev. Hort. Belge **40**: after 184.

Text-figure 1 is from a photograph of the plant received from M. de Laet.

FIG. 1.—Echinocereus delaetii.

2. **Echinocereus scheeri** (Salm-Dyck) Rümpler in Förster, Handb. Cact. ed. 2. 801. 1885.

Cereus scheeri Salm-Dyck, Cact. Hort. Dyck. 1849. 190. 1850.

Cespitose; stems procumbent, prostrate or ascending, decidedly narrowed towards the tip, 10 to 22 cm. long, yellowish green; ribs 8 to 10, rather low, not at all sinuate, somewhat spiraled; spines 7 to 12, acicular, white with brown or blackish tips; flowers 12 cm. long, rose-red to crimson, with an elongated tube; perianth-segments oblanceolate, acute; fruit not known.

Type locality: Near Chihuahua.

Distribution: Chihuahua, Mexico.

The species was named for Frederick Scheer (1792–1868), who described the cacti for Seemann in the Botany of the *Herald*.

Lemaire used this name as early as 1868 (Les Cactées 57), but did not formally transfer or describe it, and it is not published or even mentioned by Lemaire in Manuel de l'Amateur de Cactus (1845) as stated in Blühende Kakteen under plate 14. It seems to be a distinct species, related to *E. salm-dyckianus*, but with differently colored flowers and shorter spines. The variety *E. scheeri nigrispinus* was used by Scheer in Botany of the *Herald* 291.

The type of this species seems to have been lost; it was collected by John Potts, a mining engineer, at one time stationed in Chihuahua, Mexico. We know the species only from description and illustrations.

Echinocereus scheeri vars. *major* and *minor* (Monatsschr. Kakteenk. **15**: 175. 1905) and var. *robustior* (Monatsschr. Kakteenk. **15**: 161. 1905) are only garden forms.

Illustrations: Curtis's Bot. Mag. **132**: pl. 8096, as *Cereus scheeri;* Blühende Kakteen **1**: pl. 14; Schumann, Gesamtb. Kakteen f. 48.

Text-figure 2 is from a part of the second illustration above cited.

3. Echinocereus salm-dyckianus Scheer in Seemann, Bot. Herald 291. 1856.

Cereus salm-dyckianus Hemsley, Biol. Centr. Amer. Bot. 1: 545. 1880.
Echinocereus salmianus Rümpler in Förster, Handb. Cact. ed. 2. 809. 1885.
Cereus salmianus Weber, Dict. Hort. Bois 279. 1894.

Cespitose; stems more or less decumbent, 2 to 4 cm. in diameter, elongated, yellowish green; ribs 7 to 9, low, more or less sinuate; radial spines 8 or 9, acicular, yellowish, about 1 cm. long; central spine solitary, porrect, a little longer than the radials; flowers orange-colored, 8 to 10 cm. long, narrow, the tube elongated, the areoles of the flower-tube and ovary bearing white bristly spines and cobwebby hairs; perianth-segments oblanceolate to spatulate; filaments dark red; style longer than the stamens; fruit not seen.

Type locality: Near Chihuahua.

Distribution: States of Chihuahua and Durango, Mexico.

This species is in cultivation in Europe, and Dr. Rose saw it in flower at La Mortola in 1912; it was also collected by Dr. E. Palmer in Durango in 1906 (No. 205).

FIG. 2.—Echinocereus scheeri.

FIG. 3.—Echinocereus salm-dyckianus.

We have not been able to see the type specimen and it is probably not in existence.

The specific name commemorates Joseph Franz Salm-Reifferschid-Dyck (1773–1861), author of several important cactus treatises. He was the most distinguished cactologist of his time and possessed at his estate at Düsseldorf, Germany, one of the largest cactus collections ever brought together. Unfortunately, after his death the collection was permitted to disintegrate and most of his types were lost or thrown away.

Hybrids between *E. salm-dyckianus* and *Heliocereus speciosus* and with *Epiphyllum* species are reported.

Illustrations: Blühende Kakteen 1: pl. 29; Monatsschr. Kakteenk. 3: 129; Wildeman, Icon. Select. 6: pl. 202.

Text-figure 3 shows a part of the first illustration above cited.

4. **Echinocereus huitcholensis** (Weber) Gürke, Monatsschr. Kakteenk. **16**: 23. 1906.
Cereus huitcholensis Weber, Bull. Mus. Hist. Nat. Paris 10: 383. 1904.

Plants 4 to 6 cm. long, 2 to 4 cm. in diameter; radial spines 10 to 12; central spine usually solitary; flowers 11 cm. long or less, narrow, with a pronounced tube; color of perianth-segments uncertain but perhaps orange, as in *E. salm-dyckianus;* spines on ovary and tube weak, acicular; areoles of flower-tube bearing long cobwebby hairs.

Type locality: Sierra de Nayarit, Jalisco, Mexico.
Distribution: Known only from the type locality.

Weber described it as a *Cereus*, but without seeing flowers or fruit, basing it on the collection of L. Diguet of 1900. Three sheets of this collection are in the herbarium of the Museum of Paris, and with them are a flower, immature fruit, and two plants of another species, perhaps undescribed.

5. **Echinocereus pensilis** (K. Brandegee) J. A. Purpus, Monatsschr. Kakteenk. **18**: 5. 1908.
Cereus pensilis K. Brandegee, Zoe **5**: 192. 1904.

More or less cespitose; the stems often erect, 30 cm. high or, when growing on cliffs, hanging, and then nearly 2 meters long, 3 to 4 cm. in diameter; ribs 8 to 10, low; areoles about 10 mm. apart; spines needle-like, at first yellow, becoming reddish gray, the longest not over 2 cm. long; radial spines about 8; central spine 1; flowers orange-red, narrow, 5 to 6 cm. long; areoles on ovary and tube bearing short, yellow or white wool and chestnut-colored bristly spines; fruit globular, 1.5 to 2 cm. in diameter; seeds black, rugose, very oblique at base.

Type locality: Sierra de la Laguna, Lower California.
Distribution: High mountains of the Cape region of Lower California.

This species is unlike most of the known Lower Californian species in that it grows in the high mountains of the Cape region and is in fact more closely related to the species of the mountains of the United States and Mexico than to any of its near neighbors. It is a beautiful plant; Dr. Rose saw it in flower in Darmstadt in June 1912, where it was grown from a hanging basket.

The type specimen is in the Brandegee Herbarium at the University of California, but a duplicate and a photograph of the type are preserved in the United States National Herbarium.

Illustration: Monatsschr. Kakteenk. **18**: 3.

6. **Echinocereus mojavensis*** (Engelmann and Bigelow) Rümpler in Förster, Handb. Cact. ed. 2. 803. 1885.
Cereus mojavensis Engelmann and Bigelow, Proc. Amer. Acad. **3**: 281. 1856.
Cereus bigelovii Engelmann, Pac. R. Rep. **4**: pl. 4, f. 8. 1856.

FIG. 4.—Echinocereus mojavensis.

Cespitose, growing in massive clumps, often forming mounds, with hundreds of stems (500 to 800 have been recorded); stems globose to oblong, 5 to 20 cm. long, pale green; ribs 8 to 13, 5 to 6 mm. high, but becoming indistinct on old parts of stem, somewhat undulate; areoles circular, about 1 cm. apart; spines all white, or in age gray; radial spines about 10, acicular, spreading, curved, 1 to 2.5 cm. long; central spine subulate, porrect or somewhat spreading, often weak, 3 to 5 cm. long; flowers rather narrow, 5 to 7 cm. long, crimson; perianth-segments broad, obtuse or even retuse; areoles on ovary with white felt and short acicular spines; fruit oblong, 2.5 to 3 cm. long.

Type locality: On the Mojave River in California.
Distribution: Southeastern California to Nevada and Utah, western Arizona, and reported from northwestern Mexico.

* This species was named for the Mojave Desert, California, where it was first found. The specific name is sometimes incorrectly spelled *mohavensis*. Munz and Johnston report that the flowers are "pale scarlet tinged with nopal-red."

Engelmann compares this species with *E. fendleri* and in that relationship most writers have since treated it, but in its habit and shape of flower it suggests a closer relationship to the scarlet-flowered species such as *E. polyacanthus*.

Cereus bigelovii was doubtless the first name applied to this plant, but for some reason it was afterward changed, although not in the case of the legend for the first illustration cited below.

Illustrations: Pac. R. Rep. 4: pl. 4, f. 8, as *Cereus bigelovii;* Curtis's Bot. Mag. **126**: pl. 7705, as *Cereus mojavensis*.

Text-figure 4 is from a photograph obtained through S. B. Parish, taken by Dr. P. A. Munz near Pinos Wells, southern edge of the Mojave Desert, altitude 1,335 meters.

7. Echinocereus leeanus (Hooker) Lemaire in Förster, Handb. Cact. ed. 2. 828. 1885.

Cereus leeanus Hooker in Curtis's Bot. Mag. **75**: pl. 4417. 1849.
Echinocereus multicostatus Cels in Förster, Handb. Cact. ed. 2. 834. 1885.
Echinocereus leeanus multicostatus Schumann, Gesamtb. Kakteen 289. 1898.

Plant erect, about 3 dm. high, 1 dm. thick at base, tapering gradually toward the top, simple so far as known; ribs 12 to 14, acute, bearing rather closely set areoles; spines about 12, acicular, very unequal in length, the central and longest about 2.5 cm. long; flowers brick-red, 5 to 6 cm. long; inner perianth-segments somewhat spreading, spatulate to obovate, 3 cm. long, acute; filaments elongated, quite as long as the style.

Type locality: Northern Mexico.

Distribution: Mexico, but range undetermined.

The only herbarium specimens so-named which we have seen are two sheets in the herbarium of the Berlin Botanical Garden, representing two flowers which are scarlet, slender, 9 cm. long, with pale brownish spine-clusters intermixed with cob-webby white hairs. We have studied a plant sent from the Berlin Botanical Garden to the New York Botanical Garden which has not flowered.

This species differs from its relatives in having more numerous ribs.

The type specimen was presented to the Royal Botanic Gardens at Kew about 1842 by Mr. James Lee, owner of the Commercial Gardens at Hammersmith, near London, for whom it was named, and it is said to have come to him from France. *Echinocereus pleiogonus* and *E. multicostatus*, which Schumann refers here as synonyms, were described about the same time from specimens introduced into France by Cels. It is not at all unlikely that all three had a common origin. *Cereus multicostatus* Cels (Schumann, Gesamtb. Kakteen 288. 1898) is only a catalogue name.

FIG. 5.—Echinocereus leeanus.

A small specimen of this species obtained from Berlin in 1914 has been grown at the New York Botanical Garden, presumably correctly identified. The young areoles are white-woolly; the spines are acicular, the outer ones white, the central ones with brown tips.

Illustrations: Curtis's Bot. Mag. **75**: pl. 4417; Gard. Mag. Bot. **2**: pl. facing 81, as *Cereus leeanus;* Schumann, Gesamtb. Kakteen f. 49.

Text-figure 5 is from a photograph of the first illustration above cited.

8. Echinocereus triglochidiatus Engelmann in Wislizenus, Mem. Tour North. Mex. 93. 1848.

Cereus triglochidiatus Engelmann in Gray, Pl. Fendl. 50. 1849.
Cereus gonacanthus Engelmann and Bigelow, Proc. Amer. Acad. 3: 283. 1856.
Cereus paucispinus Engelmann, Proc. Amer. Acad. 3: 285. 1856.
Cereus hexaedrus Engelmann and Bigelow, Proc. Amer. Acad. 3: 285. 1856.
Echinocereus paucispinus Rümpler in Förster, Handb. Cact. ed. 2. 794. 1885.
Echinocereus gonacanthus Rümpler in Förster, Handb. Cact. ed. 2. 806. 1885.
Echinocereus hexaedrus Rümpler in Förster, Handb. Cact. ed. 2. 807. 1885.
Echinocereus paucispinus triglochidiatus Schumann, Gesamtb. Kakteen 281. 1898.
Echinocereus paucispinus gonacanthus Schumann, Gesamtb. Kakteen 281. 1898.
Echinocereus paucispinus hexaedrus Schumann, Gesamtb. Kakteen 281. 1898.

Always cespitose, with few or many simple stems, these 2 to 6 dm. long, 5 to 8 cm. in diameter, deep green, erect or spreading, 5 to 8-ribbed; spines 3 to 8, various, nearly terete to strongly angled, when young reddish to yellow, but gray in age, usually spreading, often all radial, 3 cm. long or less; flowers scarlet, 5 to 7 cm. long; perianth-segments oblong, obtuse, 3 cm. long; areoles on the flower-tube and ovary few, white-felted, the subtending scales small and red; spines on ovary and flower-tube few, red and white; fruit at first spiny, but in age smooth, bright red, 3 cm. in diameter; seeds 1.6 mm. in diameter or less.

FIGS. 6 and 7.—Echinocereus triglochidiatus.

Type locality: Wolf Creek, New Mexico.

Distribution: Western Texas, New Mexico, and Colorado.

The species here described is very variable as to habit and number and kind of spines, and has generally been separated into three or four species; Schumann treated it as a single species with three varieties; we have recognized only a single species, but it is possible that *Echinocereus paucispinus* which has nearly terete spines should be restored for certain plants in Texas.

Echinocereus monacanthus Heese (Gartenflora 53: 215. f. 32, with wrong legend) may belong here. It is a small one-jointed plant, 10 cm. long, with 7 ribs, and bears but a single spine at an areole. The flowers and fruit are unknown. The plant is said to be a native of Mexico and Texas.

Illustrations: Pac. R. Rep. 4: pl. 5, f. 2, 3, as *Cereus gonacanthus;* Pac. R. Rep. 4: pl. 5, f. 1, as *C. hexaedrus;* Cact. Mex. Bound. pl. 56, as *C. paucispinus;* Schelle, Handb. Kakteenk. 137. f. 66; Blühende Kakteen 3: pl. 124; Rümpler, Sukkulenten 139. f. 74; Förster, Handb. Cact. ed. 2. 793. f. 102, as *Echinocereus paucispinus;* N. M. Agr. Exp. Sta. Bull. 78: pl. 16, as *E. gonacanthus;* Pac. R. Rep. 4: pl. 4, f. 6, 7, as *Cereus triglochidiatus;* Cact. Journ. 2: 18, as *Echinocereus paucispinus flavispinus.*

Text-figure 6 is from a photograph of a plant sent to the New York Botanical Garden by Dr. Rose in 1913, from near Las Vegas, New Mexico; text-figure 7 shows a flowering plant sent to Washington from near Kerrville, Texas, by Mr. B. Mackensen in 1912.

FIG. 8.—Flower of Echinocereus polyacanthus. ×0.6.

FIG. 9.—Flowering branch of Echinocereus pacificus. ×0.6.

FIG. 10.—Flower of Echinocereus neomexicanus. ×0.6.

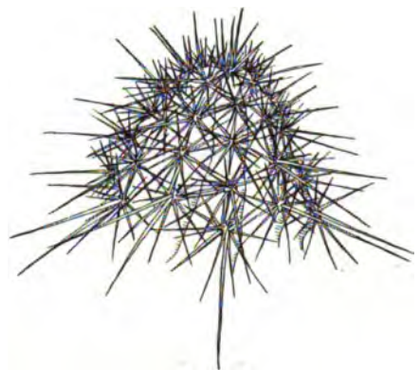


FIG. 11.—Top of joint of Echinocereus conoideus.

9. Echinocereus polyacanthus Engelmann in Wislizenus, Mem. Tour North. Mex. 104. 1848.

Cereus polyacanthus Engelmann in Gray, Pl. Fendl. 50. 1849.

Cespitose, forming clumps of 20 to 50 stems, pale green but often tinged with red; ribs usually 10, low; areoles approximate; spines gray when old, at first pale yellow, becoming more or less purplish; radial spines about 12; centrals 4, straight, elongated; flowers crimson, 6 cm. long; spines on ovary and flower-tube yellow, intermixed with cobwebby wool; fruit and seeds unknown.

Type locality: Cosihuiriachi, Chihuahua.

Distribution: Chihuahua and Durango, Mexico, to western New Mexico and southeastern Arizona.

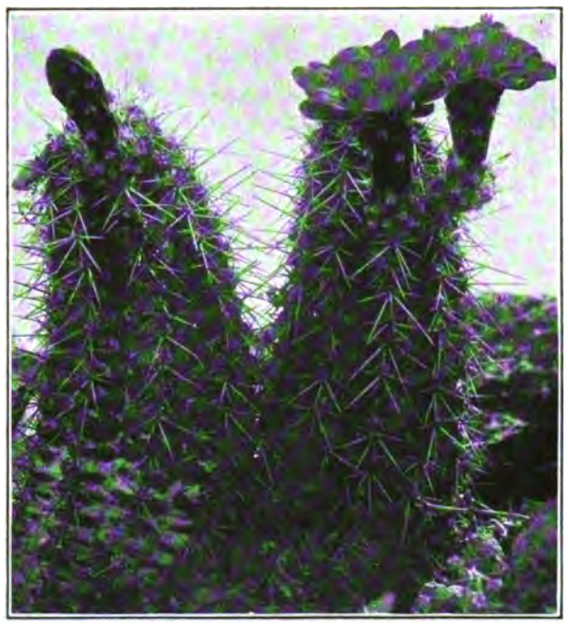


FIG. 12.—Echinocereus polyacanthus.

Echinocereus polyacanthus was described by Dr. Engelmann in 1848, based upon specimens collected by Dr. A. Wislizenus at Cosihuiriachi, a small mining town west of the city of Chihuahua. The next year Dr. Engelmann transferred it along with the other species of his genus, *Echinocereus*, to *Cereus*, and in 1859, in his report on the Cactaceae of the Mexican Boundary, redescribed and illustrated the species; the specimens used by him for this report, however, were largely from Texas and New Mexico, and this additional material represents a quite distinct species. In order to prove this point Dr. Rose in 1908 visited Cosihuiriachi, the type locality, and collected living and herbarium specimens which were found to be specifically distinct from the so-called *E. polyacanthus* from the El Paso region which now bears the name *E. rosei* Wooton and Standley. The habit of the two species is similar, but the armament is somewhat different and the flowers of the true *Echinocereus polyacanthus* produce an abundance of wool in the axils of the scales which is

lacking in the other species. The distribution of this species is much more restricted than has usually been given for it; it has been reported from Texas to California and as far south as La Paz, Lower California. The plant illustrated on plate 66 of Blühende Kakteen as this species must be referred elsewhere.

Illustrations: Tribune Hort. 4: pl. 139, as *Echinocereus polyacanthus* var.; Förster, Handb. Cact. ed. 2. f. 101; (?) Monatsschr. Kakteenk. 15: 41; (?) 17: 169; Schelle, Handb. Kakteenk. 139. f. 67; Shreve, Veg. Des. Mt. Range pl. 24; Bull. Torr. Club 35: 83. f. 1; Cact. Journ. 1: 89.

Figure 8 shows a flower of an herbarium specimen collected by Dr. Palmer near Madera, Chihuahua, in 1908; figure 12 is from a photograph of a plant collected by Professor Lloyd in the Santa Catalina Mountains, Arizona.

10. Echinocereus pacificus (Engelmann).

Cereus phoeniceus pacificus Engelmann, West Amer. Sci. 2: 46. 1886.
Cereus pacificus Coulter, Contr. U. S. Nat. Herb. 3: 397. 1896.

Cespitose, growing in clumps 30 to 60 cm. in diameter, sometimes containing 100 stems, these 15 to 25 cm. long, 5 to 6 cm. in diameter; ribs 10 to 12, obtuse; spines gray, with a reddish tinge; radial spines 10 to 12, 5 to 10 mm. long; central spines 4 or 5, the longest sometimes 25 mm. long; flowers deep red, rather small, about 3 cm. long; areoles on ovary and flower-tube bearing long tawny wool and reddish-brown bristly spines; fruit spiny.

Type locality: Todos Santos Bay, Lower California.

Distribution: Northern Lower California, recorded, apparently erroneously, from farther south.

Although the type is from the coastal hills we are inclined to refer here Mr. Brandegee's plant from the San Pedro Martir, collected May 5, 1893; the specimen shows flowers and a spine-cluster.

Mr. Brandegee's plant from Comondu Cliffs, also referred here by Coulter, may belong elsewhere; it is without flowers, however, and we are uncertain of its relationship. The spines are long and acicular and Mr. Brandegee's notes state that the stems are not dense but sometimes hang from the rocks.

Figure 9 shows a small flowering branch of an herbarium specimen collected by C. R. Orcutt in northern Lower California in 1883.

11. Echinocereus acifer (Otto) Lemaire in Förster, Handb. Cact. ed. 2. 798. 1885.

Cereus acifer Otto in Salm-Dyck, Cact. Hort. Dyck. 1849. 189. 1850.
? *Echinopsis valida densa* Regel, Gartenflora 1: 295. 1852.
Echinocereus acifer tenuispinus Jacobi in Förster, Handb. Cact. ed. 2. 798. 1885.
Echinocereus acifer brevispinulus Jacobi in Förster, Handb. Cact. ed. 2. 798. 1885.
Echinocereus durangensis Rümpler in Förster, Handb. Cact. ed. 2. 799. 1885.
Echinocereus durangensis nigrispinus Rümpler in Förster, Handb. Cact. ed. 2. 800. 1885.
Echinocereus durangensis rufispinus Rümpler in Förster, Handb. Cact. ed. 2. 800. 1885.
Echinocereus acifer trichacanthus Hildmann, Monatsschr. Kakteenk. 1: 44. 1891.
Echinocereus acifer durangensis Schumann, Gesamtb. Kakteen 287. 1898.
Echinocereus acifer diversispinus Schumann, Gesamtb. Kakteen 287. 1898.

Cespitose, glossy green, erect; ribs 10, strongly tubercled; radial spines 5 to 10, 10 to 16 mm. long, pale brownish, bulbose and purplish at base; centrals 4 (Schumann says 1), stout, purplish brown, the three upper erect, the lower and stouter one subdeflexed; flowers scarlet.

Type locality: Not cited.

Distribution: Durango and Coahuila, according to Professor Schumann.

Professor Schumann recognized three varieties, based chiefly on the differences in the spines.

We have studied a small plant secured from the Berlin Botanical Garden.

The illustration in Blühende Kakteen cited below shows a plant with almost continuous ribs and one stout central spine. It presumably represents a different species.

Echinocereus acifer was mentioned by Lemaire in 1868 (Les Cactées 57), but the name was not published at that place.

Illustrations: Monatsschr. Kakteenk. 1: opp. 44, as *Echinocereus acifer trichacanthus;* Förster, Handb. Cact. ed. 2. 637. f. 85; (?) Gartenflora 1: pl. 29, as *Echinopsis valida densa;* (?) Blühende Kakteen 2: pl. 106; Gartenwelt 9: 410; Gard. Chron. III. 36: 245. f. 100.

12. **Echinocereus octacanthus** (Mühlenpfordt).

Echinopsis octacantha Mühlenpfordt, Allg. Gartenz. 16: 19. 1848.
Cereus roemeri Engelmann in Gray, Pl. Fendl. 50. 1849. Not Mühlenpfordt, 1848.
Echinocereus roemeri Rümpler in Förster, Handb. Cact. ed. 2. 792. 1885.
Cereus octacanthus Coulter, Contr. U. S. Nat. Herb. 3: 395. 1896.

Cespitose, with many simple joints; joints ovoid, yellowish green, 7 to 10 cm. long, 5 to 7 cm. in diameter; ribs 7 to 9, obtuse, somewhat tubercled; areoles when young white-woolly, in age naked, 8 to 16 mm. apart; spines rigid, grayish brown; radial spines 7 or 8, 10 to 24 mm. long; central spine solitary, stouter than the radials, porrect, 2 to 3 cm. long; flowers red, 5 cm. long, remaining open for several days; fruit unknown.

Type locality: Northern Texas.

Distribution: Known to us definitely only from northwestern Texas, but reported by Coulter from New Mexico and Utah.

M. Cary in 1907 collected at Dolores, Colorado, a plant which comes nearer this species than anything which we have seen, except a plant from Marathon, Texas, which has the armament and flowers called for by the original description. The plant referred to in the following illustration in the Garden is said to have come from northern California but this is undoubtedly an error.

Illustrations: Hort. Franc. II. 7: pl. 22; Garden 13: 291, as *Cereus roemeri.*

13. **Echinocereus neo-mexicanus** Standley, Bull. Torr. Club 35: 87. 1908.

Cespitose, but with only a few stout simple joints, 18 to 25 cm. long, 7 cm. in diameter, obtuse, glaucous-green; ribs 11 or 12, obtuse, low, somewhat tuberculate; areoles 1 to 1.5 cm. apart; spines slender, subulate, somewhat spreading; radial spines 13 to 16, the longest only 1.5 cm. long, white or nearly so; central spines 6, the lowest one yellowish to almost white, the others reddish, sometimes 4 cm. long; flowers abundant, appearing near the top or along the sides of the plant, 5 cm. long, narrow and not spreading at the mouth, bright scarlet; perianth-segments acute, firm in texture, 2 cm. long, 6 mm. broad; stamens about half as long as the style; stigma-lobes 7; ovary and flower-tube bearing clusters of bristly spines; fruit not known.

Type locality: Mesa west of the Organ Mountains, New Mexico.

Distribution: Known only from the type locality.

Illustrations: Bull. Torr. Club 35: f. 3, 4, 5.

Figure 10 is copied from the illustration above cited.

14. **Echinocereus conoideus** (Engelmann and Bigelow) Rümpler in Förster, Handb. Cact. ed. 2. 807. 1885.

Cereus conoideus Engelmann and Bigelow, Proc. Amer. Acad. 3: 284. 1856.
Echinocereus phoeniceus conoideus Schumann, Gesamtb. Kakteen 283. 1898.

Plants cespitose; joints somewhat conic at apex; ribs 9 to 11; radial spines 10 to 12, slender, rigid; central spines 2.5 to 8 cm. long, generally 5 cm. long; flowers 6 cm. long, scarlet, slender; ovary and flower-tube spiny.

Type locality: On the Upper Pecos, New Mexico.

Distribution: Southeastern New Mexico and western Texas.

The species is closely related to *Echinocereus coccineus,* perhaps not specifically distinct from it.

Coulter takes for this species the name *Cereus roemeri* Mühlenpfordt (Allg. Gartenz. 16: 19. 1848), which we refer to *E. coccineus.*

Illustrations: Pac. R. Rep. 4: pl. 4, f. 4, 5, as *Cereus conoideus;* N. Mex. Agr. Exp. Sta. Bull. 78: pl. [17]; Bull. Torr. Club 35: 85. f. 2.

Figure 11 is copied from the first illustration above cited.

15. Echinocereus coccineus Engelmann in Wislizenus, Mem. Tour North. Mex. 94. 1848.

Cereus roemeri Mühlenpfordt, Allg. Gartenz. 16: 19. 1848.
Cereus coccineus Engelmann in Gray, Pl. Fendl. 50, 51. 1849. Not Salm-Dyck, 1828.
? *Echinopsis valida densa* Regel, Gartenflora 1: 295. 1852.
Cereus mojavensis zuniensis Engelmann, Proc. Amer. Acad. 3: 281. 1856.
Cereus phoeniceus Engelmann, Proc. Amer. Acad. 3: 284. 1856.
Echinocereus phoeniceus Rümpler in Förster, Handb. Cact. ed. 2. 788. 1885.
Echinocereus phoeniceus albispinus Rümpler in Förster, Handb. Cact. ed. 2. 789. 1885.
Echinocereus phoeniceus longispinus Rümpler in Förster, Handb. Cact. ed. 2. 789. 1885.
Echinocereus phoeniceus rufispinus Rümpler in Förster, Handb. Cact. ed. 2. 789. 1885.
Echinocereus krausei De Smet in Förster, Handb. Cact. ed. 2. 789. 1885.
Echinocereus mojavensis zuniensis Rümpler in Förster, Handb. Cact. ed. 2. 803. 1885.
Echinocereus phoeniceus inermis Schumann, Monatsschr. Kakteenk. 6: 150. 1896.
Echinocereus roemeri Rydberg, Bull. Torr. Club 33: 146. 1906. Not Rümpler, 1885.

Usually densely cespitose, often forming large mounds a meter in diameter, containing sometimes 200 simple stems, these 2 dm. high or less, 3 to 5 cm. in diameter; ribs 8 to 11, somewhat tubercled; radial spines acicular, 8 to 12, 1 to 2 cm. long, usually white; central spines several, longer and stouter than the radials, usually yellowish or whitish but in some specimens reddish or blackish; flowers crimson, 5 to 7 cm. long; perianth-segments broad, obtuse or retuse; areoles on flower and ovary felted and bearing short white bristly spines.

Type locality: About Santa Fé, New Mexico.

Distribution: New Mexico and Arizona to Utah and Colorado.

Schumann describes and figures a plant entirely without spines, but whether it is common or not we do not know. This was published as a variety, *E. phoeniceus inermis* (Monatsschr. Kakteenk. 6: 150. 1896), but it often passes as *E. inermis*, although never described as such. Some years ago such a plant was sent to Washington from Utah by Mr. M. E. Jones and is still growing in the Cactus House, but it has not since flowered.

Coulter has combined this species with *Mammillaria aggregata* Engelmann (Emory, Mil. Reconn. 157. f. 1. 1848) taking both up as *Cereus aggregatus* Coulter (Contr. U. S. Nat. Herb. 3: 396. 1896), but we do not believe that they are the same; Rydberg has used the name *Echinocereus aggregatus* (Bull. Torr. Club 33:146. 1906) for this plant.

Echinopsis valida densa Regel (Gartenflora 1: pl. 29. 1852; also Förster, Handb. Cact. ed. 2. f. 85) is referred by Schumann to both *Echinocereus acifer* and *E. phoeniceus* (Gesamtb. Kakteen 239, 283). To us it suggests *E. fendleri*, although it has differently colored flowers.

Illustrations: ? Gartenflora 1: pl. 29, as *Echinopsis valida densa;* Gartenwelt 1: 85, 89; 4: 159, as *Cereus phoeniceus;* Gartenwelt 1: 89, as *Cereus phoeniceus inermis;* Gartenwelt 4: 159, as *Echinocereus phoeniceus inermis;* Curtis's Bot. Mag. 110: pl. 6774, as *Cereus pauci-spinus* (*fide* Schumann); Pac. R. Rep. 4: pl. 4, f. 9, as *Cereus bigelovii zuniensis;* Gartenwelt 4: 157, as *Echinocereus phoeniceus;* Monatsschr. Kakteenk. 6: 151, as *Echinocactus phoeniceus inermis* (through typographical error); N. Mex. Agr. Exp. Sta. Bull. 78: pl. [18].

Plate II, figure 1, shows a flowering plant collected by E. A. Goldman in Arizona; figure 2 shows an open flower.

16. Echinocereus rosei Wooton and Standley, Contr. U. S. Nat. Herb. 19: 457. 1915.

Cespitose, forming small compact clumps, the stems 1 to 2 dm. long, 5 to 8 cm. in diameter, sometimes as many as 40; ribs 8 to 11, obtuse; areoles rather closely set; spines pinkish to brownish gray; radial spines about 10, spreading; centrals 4, 4 to 6 cm. long; flowers 4 to 6 cm. long, scarlet; inner perianth-segments broad, obtuse; spines on ovary and flower-tube brownish or yellowish, intermixed with short hairs; fruit spiny.

Type locality: Agricultural College, New Mexico.

Distribution: In mountains and dry hills and sometimes on the mesas of southern New Mexico, western Texas, and adjacent parts of northern Mexico.

M. E. Eaton del.

1. Top of flowering plant of *Echinocereus coccineus*.
2. Flower of same.
3. Flowering plant of *Echinocereus chloranthus*.
4. Flowering plant of *Echinocereus viridiflorus*.
5. Flowering plant of *Echinocereus maritimus*.

(All natural size.)

A. Hoen & Co

This species passes generally as *E. polyacanthus* Engelmann, a Mexican species with which it was confused in the Report on the Cactaceae of the Mexican Boundary, but as stated by Mr. Standley that species "is amply separated by the presence of long, white wool in the areoles of the ovary and fruit."

Illustrations: Cact. Mex. Bound. pl. 54, 55, as *Cereus polyacanthus*.

Figure 13 is from a photograph of a plant obtained on the Sierra Blanca, Texas, by Rose, Standley, and Russell in 1910, which afterward flowered in the cactus house of the U. S. Department of Agriculture.

FIG. 13.—Echinocereus rosei.

FIG. 14.—Echinocereus maritimus.

17. Echinocereus maritimus (Jones) Schumann, Gesamtb. Kakteen 273. 1898.

Cereus maritimus Jones, Amer. Nat. 17: 973. 1883.
Cereus flaviflorus Engelmann in Coulter, Contr. U. S. Nat. Herb. 3: 391. 1896.
Echinocereus flaviflorus Schumann, Gesamtb. Kakteen 274. 1898.

Decidedly cespitose, often forming clumps 60 to 90 cm. broad and 30 cm. high, sometimes containing 200 joints; individual joints globose to short-cylindric, 5 to 16 cm. long; ribs 8 to 10; areoles 10 to 12 mm. apart; radial spines about 10, spreading; central spines 4, stout and angled, 2.5 to 3.5 cm. long; flowers small, including the ovary 3 to 4 cm. long, arising from near the top of the plant, light yellow; inner perianth-segments oblanceolate, rounded at apex; ovary not very spiny; fruit not seen.

Type locality: Ensenada, Lower California.

Distribution: West coast of Lower California.

This is a low, coastal species, perhaps extending all along the west coast of central Lower California. It was first found by Marcus E. Jones at Ensenada and was recently collected at the same locality by Ivan M. Johnston, April 7, 1921 (No. 3007). Dr. Rose found it in abundance about San Bartolomé Bay and introduced a great quantity into cultivation. It has frequently flowered both in the New York Botanical Garden and at Washington. A specimen of the original collection is preserved in the U. S. National Museum.

The name *Cereus glomeratus* Engelmann, unpublished, is cited by Orcutt (West Amer. Sci. 13: 28. 1902) as a synonym of *Echinocereus maritimus*. The name is also used by Schumann (Gesamtb. Kakteen 274. 1898), but it is not found in any of Engelmann's works.

Plants collected by Mr. C. R. Orcutt in Lower California have been referred as *Echinocereus orcuttii* (Kew Bull. Misc. Inf. 1921: 36), without description.

Illustration: Cact. Journ. 2: 123.

Plate II, figure 5, shows a plant in flower. Figure 14 is from a photograph of a plant of the same collection brought to Washington from San Bartolomé Bay, Lower California, in 1911 by Dr. Rose (No. 16189).

18. Echinocereus subinermis Salm-Dyck in Seemann, Bot. Herald 291. 1856.

Cereus subinermis Hemsley, Biol. Contr. Amer. Bot. 1: 546. 1880.

At first simple, 10 to 12 cm. high, afterwards a little branching at base, when young pale green, afterwards bluish and finally darker green, erect; ribs 5 to 8, broad, somewhat sinuate; spines all radial, small, conic, 1 to 2 mm. long, yellow, 3 or 4, deciduous; flowers large, 5 to 7 cm. long, yellow; perianth-segments oblanceolate, acute; spines of areoles on ovary and flower-tube short, white; fruit not known.

Type locality: Near Chihuahua, Mexico.

Distribution: Northern Mexico.

This species was introduced into Europe in 1845. It recently flowered in Germany. We have studied a plant sent from Berlin to the New York Botanical Garden, in 1902, which died before blooming. This plant is the least armed of the genus.

Illustrations: Blühende Kakteen 1: pl. 3; Monatsschr. Kakteenk. 26: 99.

Figure 15 is copied from the first illustration cited above.

19. Echinocereus luteus Britton and Rose, Contr. U. S. Nat. Herb. **16**: 239. 1913.

Stem short to elongated,* sometimes branching near base, bluish green, more or less purplish, 8 or 9-ribbed; ribs rather thin, barely undulate, rounded; areoles small, 10 to 12 mm. apart; spines small, the radials 6 to 8, unequal, 2 to 8 mm. long, widely spreading, white with darker tips; central spine single, porrect; flowers on each rib appearing near top of plant and from second or third areole; flower-buds acute, reddish, covered with long, brownish bristles; areoles on ovary and flower-tube bearing white wool and light-colored spines with dark tips; flowers pale yellow, delicately sweet-scented, 7 cm. long, including the ovary; outer perianth-segments streaked with red; inner perianth-segments lemon-yellow, oblanceolate, acute; filaments light yellow.

FIG. 15.—Echinocereus subinermis.

Type locality: Above Alamos, Sonora, Mexico.

Distribution: Western Mexico.

Illustration: Contr. U. S. Nat. Herb. 16: pl. 67.

Figure 16 is from a photograph of the type specimen.

20. Echinocereus chloranthus (Engelmann) Rümpler in Förster, Handb. Cact. ed. 2. 814. 1885.

Cereus chloranthus Engelmann, Proc. Amer. Acad. 3: 278. 1856.

Cylindric, usually simple, 8 to 15 cm. long, 5 to 7 cm. in diameter; ribs about 13, often nearly hidden by the densely set spines; areoles nearly circular; radial spines several, spreading; centrals 3 or 4, not angled, in a vertical row, one much more elongated than the others, 2 to 3 cm. long; flowers yellowish green, 2 cm. long; fruit small, nearly globular, 5 to 10 cm. long, dark purplish red, covered with small bristly spines; seeds black, dull, pitted, the hilum nearly basal, round.

Type locality: About El Paso, Texas.

Distribution: Western Texas, southeastern New Mexico, and northern Mexico.

This species is somewhat like *Echinocereus viridiflorus*, having similar small flowers. It is usually more elongated, with longer central spines and with the flowers appearing lower down on the plant, generally below the middle.

*Señor Ortega has sent us an unusual specimen, 2 dm. high, from Mazatlan (exact locality not given).

Illustrations: Cact. Mex. Bound. pl. 37, 38; Amer. Gard. 11:473, as *Cereus chloranthus;* Cact. Journ. 2: 19; Cycl. Amer. Hort. Bailey 2: f. 747; Engler and Prantl, Pflanzenfam. 3^{6a}: f. 57, D; Stand. Cycl. Hort. Bailey 2: f. 1375; Schelle, Handb. Kakteenk. 128. f. 59; Förster, Handb. Cact. ed. 2. 815. f. 107.

Plate II, figure 3, shows a flowering plant sent by Dr. Rose to the New York Botanical Garden in 1913 from the east side of the Franklin Mountains near El Paso, Texas.

21. Echinocereus viridiflorus Engelmann in Wislizenus, Mem. Tour North. Mex. 91. 1848.

Cereus viridiflorus Engelmann in Gray, Pl. Fendl. 50. 1849.
Cereus viridiflorus cylindricus Engelmann, Proc. Amer. Acad. 3: 278. 1856.
Echinocactus viridiflorus Pritzel, Icon. Bot. Index 2: 113. 1866.
Echinocereus viridiflorus cylindricus Rümpler in Förster, Handb. Cact. ed. 2: 812. 1885.
Echinocereus strausianus Haage jr. in Quehl, Monatsschr. Kakteenk. 10: 70. 1890.
Cereus viridiflorus tubulosus Coulter, Contr. U. S. Nat. Herb. 3: 383. 1896.
Echinocereus viridiflorus tubulosus Heller, Cat. N. Amer. Pl. ed. 2. 8. 1900.

Plants small, nearly globular, but sometimes cylindric and 20 cm. high, simple, or more or less cespitose; ribs 14, low; areoles elongated; spines white, dark brown or variegated, usually arranged in circular bands of light and dark about the plant; radial spines about 16, appressed; centrals, when present, 2 or 3, arranged in a perpendicular row, often elongated and then 2 cm. long; flowers greenish, 2 to 2.5 cm. long; perianth-segments obtuse; fruit 10 to 12 mm. long; seeds 1 to 1.2 mm. long.

FIG. 16.—Echinocereus luteus.

FIG. 17.—Echinocereus viridiflorus.

Type locality: Prairies about Wolf Creek, New Mexico.

Distribution: Southern Wyoming to eastern New Mexico, western Kansas, western Texas, and South Dakota.

This species is very common on the plains of the West. It is usually deeply seated, with the low top hidden in the grass, so that it is not easily seen. It is widely distributed, rather variable in its habit and spines, but is easily distinguished from all the other species of this genus. It is frequently introduced into our collections, but lasts only a few years. It extends farther north than any other species of the genus and was one of the first to be collected in the United States, having been found by Dr. Wislizenus in 1846. It is known in Wyoming as green-flowered petaya (M. Cary).

Echinocereus viridiflorus var. *gracilispinus* (Rümpler in Förster, Handb. Cact. ed. 2. 814. 1885) and var. *major* (Monatsschr. Kakteenk. 16: 142. 1906) are simply garden forms.

Echinocereus labouretii Förster (Handb. Cact. ed. 2. 811. 1885) is given as a synonym of this species. *Echinocereus labouretianus* Lemaire (Cactées 57. 1868) is also to be referred here.

Illustrations: Cact. Mex. Bound. pl. 36; Gartenwelt 1: 89; Curtis's Bot. Mag. 125: pl. 7688, as *Cereus viridiflorus;* Förster, Handb. Cact. ed. 2. 813. f. 106; Cact. Journ. 2: 19; Britton and Brown, Illustr. Fl. 2: 460. f. 2522; ed. 2. 2: 569. f. 2981; Monatsschr. Kakteenk. 15: 57; Schelle, Handb. Kakteenk. 129. f. 60; Gartenwelt 4: 159; Blanc, Cacti 59. No. 842.

Plate II, figure 4, shows a flowering plant sent to the New York Botanical Garden by Dr. Rose from Syracuse, Kansas, in 1912. Figure 17 is from a photograph of a plant from Colorado Springs collected by F. W. Homan in 1912.

22. Echinocereus grandis sp. nov.

Stems usually single or in small clusters, sub-cylindric, 1 to 4 dm. high, 8 to 12 cm. in diameter; ribs 21 to 25, low; areoles large, longer than broad, about 1 cm. apart; spines dull white or cream-colored, rather short and stiff, the radials 15 to 25, the centrals 8 to 12, often in 2 rows; flower 5 to 6 cm. long, unusually narrow, with a short limb; ovary and flower-tube densely clothed with clusters of pale, straw-colored spines intermixed with white hairs; outer perianth-segments white, with a green medial line; inner perianth-segments narrow, 1.5 cm. long, white with green bases; filaments green; style white; stigma-lobes green; fruit densely spiny.

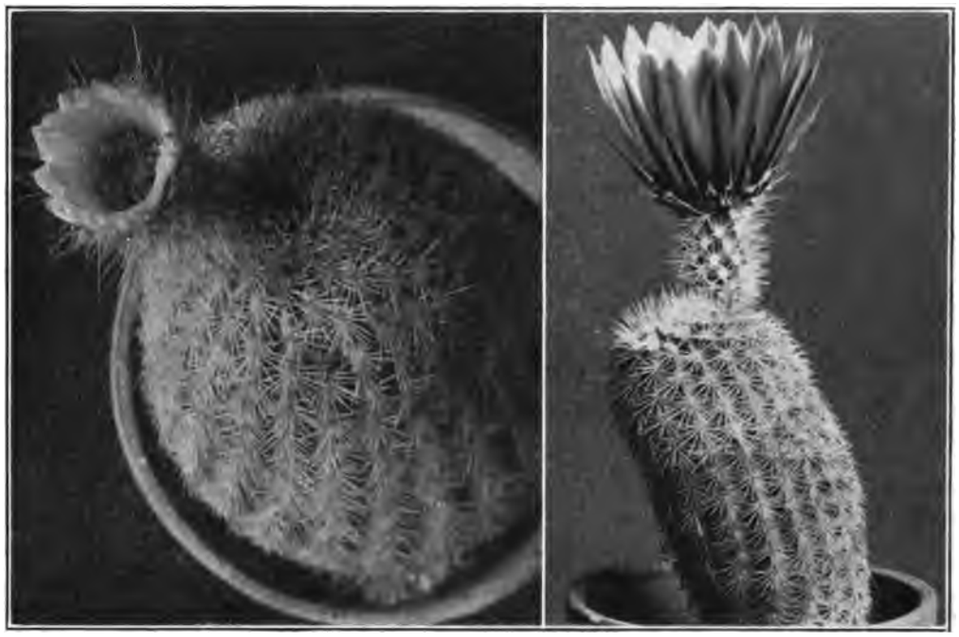


FIG. 18.—Echinocereus grandis. FIG. 19.—Echinocereus dasyacanthus.

Collected on San Esteban Island in the Gulf of California, April 13, 1911, by J. N. Rose (No. 16823); on San Lorenzo Island by Ivan M. Johnston in 1921 (Nos. 3541, 4198); and on Nolasco Island by Mr. Johnston (No. 3137).

This plant was very common in a dry creek bed and in an adjoining valley as well as on the low hills on the Island of San Esteban, which Dr. Rose visited in 1911. Many fine plants were collected. One flowered in the New York Botanical Garden in 1912; three plants were grown in the Cactus House, U. S. Department of Agriculture, in 1913, of one of which a photograph was taken.

Plate III, figure 3, shows a flowering plant sent by Dr. Rose to the New York Botanical Garden from the type locality in 1911. Figure 18 is from a photograph of one of the plants which bloomed in Washington.

23. Echinocereus dasyacanthus Engelmann in Wislizenus, Mem. Tour North. Mex. 100. 1848.

Cereus dasyacanthus Engelmann in Gray, Pl. Fendl. 50. 1849.
Cereus dasyacanthus neo-mexicanus Coulter, Contr. U. S. Nat. Herb. 3: 384. 1896.
Echinocereus spinosissimus Walton, Cact. Journ. 2: 162. 1899.
Echinocereus rubescens Dams, Monatsschr. Kakteenk. 15: 92. 1905.

Plants usually simple, cylindric, 1 to 3 dm. high, very spiny; ribs 15 to 21, low, 2 to 3 cm. high; areoles approximate, 3 to 5 mm. apart, short-elliptic; radial spines 16 to 24, more or less spreading, 1.5 cm. long or less, at first pinkish but gray in age; central spines 3 to 8, a little stouter than the radials, never in a single row; flowers from near the apex, often very large, often 10 cm. long, yellowish, or drying reddish; outer perianth-segments linear-oblong, 4 to 5 cm. long, acute; inner perianth-segments oblong, 5 cm. long; ovary very spiny; fruit nearly globular, 2.5 to 3.5 cm. in diameter, purplish, edible.

Type locality: El Paso, Texas.

Distribution: Western Texas, southern New Mexico, and northern Chihuahua. It has been reported from Arizona, but doubtless wrongly.

Echinocereus papillosus rubescens (Monatsschr. Kakteenk. 15: 92. 1905) was only a garden name for *E. rubescens*.

Echinocereus degandii (Monatsschr. Kakteenk. 5: 123. 1895), only a catalogue name from Rebut, is here referred by Schumann in his monograph.

This is undoubtedly the plant which Walton calls the "true *E. spinosissimus*" (Cact. Journ. 2: 162. 1899), although we do not find the name referred to elsewhere.

Illustrations: Cact. Mex. Bound. pl. 39, 40, 41, f. 1, 2; Gard. Chron. III. 32: 252; West Amer. Sci. 13: 10, as *Cereus dasyacanthus;* Monatsschr. Kakteenk. 15: 89, as *Echinocereus rubescens;* Blühende Kakteen 2: pl. 81; Förster, Handb. Cact. ed. 2. f. 110; Gartenwelt 7: 290; Schelle, Handb. Kakteenk. 130. f. 61; Cact. Journ. 1: 89; 2: 19.

Figure 19 is from a photograph of a flowering plant collected by Elmer Stearns at Juarez, Mexico, in 1906.

24. Echinocereus ctenoides (Engelmann) Rümpler in Förster, Handb. Cact. ed. 2. 819. 1885.

Cereus ctenoides Engelmann, Proc. Amer. Acad. 3: 279. 1856.

So far as known simple, cylindric, elongated, 10 to 40 cm. long, 8 to 10 cm. in diameter, decidedly banded with pink and gray as in the rainbow cactus; ribs 15 to 17, low; areoles crowded together, short-elliptic; radial spines often as many as 20, not spreading but standing out at an angle to the ribs; central spines 8 to 10, arranged in a single row or sometimes a little irregular; flowers up to 10 cm. long, about as wide as long when fully expanded, bright to reddish yellow; filaments yellow; style white; ovary and fruit very spiny.

Type locality: Eagle Pass, Texas.

Distribution: Southern Texas and Chihuahua.

This species is near *Echinocereus dasyacanthus*; it differs somewhat in its spines and it has a more southern range. It may not be specifically distinct.

Echinocactus ctenoides (Index Kewensis Suppl. 1. 476) is a mistake for *Echinocereus ctenoides*.

Illustrations: Cact. Mex. Bound. pl. 42*; Dict. Gard. Nicholson 4: 511, f. 7; Suppl. 217. f. 229; Watson, Cact. Cult. 73. f. 20, as *Cereus ctenoides;* Förster, Handb. Cact. ed. 2. 820. f. 109.

Figure 20 is a copy of the first illustration above cited.

25. Echinocereus papillosus Linke in Förster, Handb. Cact. ed. 2. 783. 1885.

Echinocereus texensis Rünge, Monatsschr. Kakteenk. 4: 61. 1894. Not Jacobi, 1856.
Echinocereus ruengei Schumann, Monatsschr. Kakteenk. 5: 124. 1895.
Cereus papillosus Berger, Rep. Mo. Bot. Gard. 16: 80. 1905.

* All the additional illustrations cited here are copied from this plate.

More or less cespitose, rather dark green, decumbent or ascending, 5 to 30 cm. long, 2 to 4 cm. in diameter; ribs 6 to 10, prominent, strongly tubercled; radial spines acicular, spreading, about 7, white to yellowish, 1 cm. long or less; central spine solitary, acicular, porrect, 12 mm. long or more; flowers large, 10 to 12 cm. broad, yellow with a reddish center, with rather few perianth-segments 4 to 6 cm. long, oblong-spatulate, acuminate, more or less serrate; scales on ovary red, spreading; fruit not known.

Type locality: Not cited.

Distribution: Western Texas.

Although this species is supposed to come from the vicinity of San Antonio, Texas, no specimens are known to us from that place but we have an herbarium specimen collected by Miss Mary B. Croft at San Diego, Texas. It is one of the few species in the genus with yellow flowers and ought easily to be distinguished from other Texan species.

Illustration: Blühende Kakteen **2**: pl. 115.

FIG. 20.—Echinocereus ctenoides. FIG. 20*a*.—Echinocereus pentalophus.

26. Echinocereus blanckii* (Poselger) Palmer, Rev. Hort. **36**: 92. 1865.

Cereus blanckii Poselger, Allg. Gartenz. **21**: 134. 1853.
Cereus berlandieri Engelmann, Proc. Amer. Acad. **3**: 286. 1856.
Echinocereus poselgerianus Linke, Allg. Gartenz. **25**: 239. 1857.
Echinocereus berlandieri Rümpler in Förster, Handb. Cact. ed. 2. 776. 1885.
Echinocereus leonensis Mathsson, Monatsschr. Kakteenk. **1**: 66. 1891.
Cereus leonensis Orcutt, West Amer. Sci. **13**: 27. 1902.
Cereus poselgerianus Berger, Rep. Mo. Bot. Gard. **16**: 80. 1905.

*The specific name is often spelled *blankii*.

Procumbent; joints slender, 3 to 15 cm. long, 2 to 2.5 cm. in diameter; ribs 5 to 7, strongly tuberculate, or when turgid scarcely tubercled; areoles 1 to 1.5 cm. apart; radial spines 6 to 8, 8 to 10 mm. long, white; central spine solitary, 10 to 50 mm. long, brownish to black; flowers purple, 5 to 8 cm. long; perianth-segments narrow, oblanceolate, acute.

Type locality: Near Camargo, state of Tamaulipas, Mexico.

Distribution: Northeastern Mexico and southern Texas.

Dr. Rose in 1912 examined specimens labeled *E. leonensis* in the collection of Mr. Haage jr. at Erfurt which seemed to be *E. blanckii.*

Echinocereus flaviflorus Hildmann (Schumann, Gesamtb. Kakteen 264. 1898), unpublished, is referred to *E. leonensis*, its flowers not being yellow as the name would imply.

This species is named for P. A. Blanck, a pharmacist in Berlin and a friend of H. Poselger. It is closely related to *E. pentalophus.*

Echinocactus leonensis (Schumann, Monatsschr. Kakteenk. 5: 76) seems to have been intended for *Echinocereus leonensis* Mathsson.

FIG. 21.—Echinocereus blanckii.

Illustrations: Dict. Gard. Nicholson 4: 511. f. 5; Suppl. 217. f. 227, as *Cereus blankii;* Blühende Kakteen 1: pl. 37; Cact. Journ. 1: 135; 2: 19; Förster, Handb. Cact. ed. 2. f. 97; Monatsschr. Kakteenk. 7: 154; Ann. Rep. Smiths. Inst. 1908: pl. 3, f. 2; Schelle, Handb. Kakteenk. 122. f. 55, as *Echinocereus berlandieri;* Cact. Mex. Bound. pl. 58; Dict. Gard. Nicholson 4: 510. f. 4; Suppl. 216. f. 226, as *Cereus berlandieri;* Monatsschr. Kakteenk. 1: opp. 66, as *Echinocereus leonensis;* Blühende Kakteen 2: pl. 70; Förster, Handb. Cact. ed. 2. f. 98; Rev. Hort. 36: following 92.

Plate III, figure 4, shows a flowering plant sent to the New York Botanical Garden from the Berlin Botanical Garden in 1902. Figure 21 is from a photograph taken by Robert Runyon at Reynosa, Mexico, July 8, 1921.

27. **Echinocereus pentalophus** (De Candolle) Rümpler in Förster, Handb. Cact. ed. 2. 774. 1885.

Cereus pentalophus De Candolle, Mém. Mus. Hist. Nat. Paris 17: 117. 1828.
Cereus pentalophus simplex De Candolle, Mém. Mus. Hist. Nat. Paris 17: 117. 1828.
Cereus pentalophus subarticulatus De Candolle, Mém. Mus. Hist. Nat. Paris 17: 117. 1828.
Cereus pentalophus radicans De Candolle, Mém. Mus. Hist. Nat. Paris 17: 117. 1828.
Cereus propinquus De Candolle in Salm-Dyck, Allg. Gartenz. 1: 366. 1833.

Cereus procumbens Engelmann in Gray, Pl. Fendl. 50. 1849.
Cereus pentalophus leptacanthus Salm-Dyck, Cact. Hort. Dyck. 1849. 42. 1850.
Echinocereus procumbens Rümpler in Förster, Handb. Cact. ed. 2. 781. 1885.
Echinocereus leptacanthus Schumann, Gesamtb. Kakteen 260. 1898.

Procumbent, with ascending branches, deep green; ribs 4 to 6, somewhat undulate, bearing low tubercles; radial spines 4 or 5, very short, white with brown tips; central spine 1, rarely wanting; flowers reddish violet, large, 7 to 12 cm. long; perianth-segments broad, rounded at apex; stamens borne on the lower half of throat for a distance of about 12 mm.; tube proper not much broader than the style, purple within, 8 mm. long; filaments short; style a little longer than the filaments; scales on the ovary and flower-tube bearing long cobwebby hairs and brownish spines; style stiff, 3.5 cm. long.

Type locality: Mexico.

Distribution: Eastern Mexico and southern Texas.

This is an attractive species and does fairly well in greenhouse cultivation, usually producing its beautiful flowers very early in the spring; its growth is much modified by indoor treatment, where the spines, especially, are changed.

Echinocereus procumbens longispinus (Monatsschr. Kakteenk. 12: 135. 1902) is only a form with very long spines. The wild plants in this and the following species have longer spines than the cultivated ones.

Echinocereus procumbens has usually been recognized as a distinct species but we believe we are justified in referring it as above.

In 1837 when Pfeiffer redescribed the varieties of this species he added *Cereus propinquus* De Candolle (*Echinocereus propinquus* Monatsschr. Kakteenk. 5: 124. 1895), as a synonym of variety *simplex*, and *C. leptacanthus* De Candolle, as a synonym of variety *subarticulatus*, but we do not find that De Candolle himself ever published these names.

This species was figured in Curtis's Botanical Magazine in 1839, about 10 years after its introduction from Mexico by Thomas Coulter. Although we have no definite information on this point, it is not unlikely that it was made from a part of the original stock. As the type of the species is lost, we have assumed that this illustration is typical. The species was taken up by Schumann, and by all writers since, under the much later name, *Echinocereus leptacanthus* Schumann; this is the name used by Pfeiffer, but as a synonym as mentioned above.

Illustrations: Dict. Hort. Bois 280. f. 198; Deutsches Mag. Gart. Blumen. 1868: pl. opp. 8, as *Cereus pentalophus;* Dict. Gard. Nicholson 4: 512. f. 9; Suppl. 218. f. 232; Rev. Hort. 36: opp. 171, as *Cereus leptacanthus;* Curtis's Bot. Mag. 65: pl. 3651, as *Cereus pentalophus subarticulatus;* Blühende Kakteen 1: pl. 15; Förster, Handb. Cact. ed. 2. 785. f. 100; Schelle, Handb. Kakteenk. 125. f. 57, as *Echinocereus leptacanthus;* Curtis's Bot. Mag. 117: pl. 7205; Dict. Gard. Nicholson 4: 513. f. 12; Suppl. f. 234; Cact. Mex. Bound. pl. 59, f. 1 to 11, as *Cereus procumbens;* Cact. Journ. 1: 109, 136, 164; 2: 173; Förster, Handb. Cact. ed. 2. 782. f. 99; Rümpler, Sukkulenten 136. f. 72; Schelle, Handb. Kakteenk. 124. f. 56, as *Echinocereus procumbens.*

Plate III, figure 1, shows a flowering joint of a plant sent by Dr. Rose to the New York Botanical Garden in 1913. Figure 20*a* is copied from the first illustration above cited.

28. Echinocereus sciurus (K. Brandegee).

Cereus sciurus K. Brandegee, Zoe 5: 192. 1904.

Densely cespitose, with many individuals forming clumps sometimes 60 cm. broad; stems slender, often 20 cm. long, often nearly hidden by the many spines; ribs 12 to 17, low, divided into numerous tubercles 5 to 6 mm. apart; areoles small, approximate, circular, at first woolly, becoming naked; radial spines 15 to 18, sometimes 15 mm. long, slender, pale except the brownish tips; centrals usually several, shorter than the radials; flower-buds covered with numerous slender brown-tipped spines; flowers described as 7 cm. long, about 9 cm. broad when fully open; inner perianth-segments in 2 to 4 rows, bright magenta; stamens numerous, with greenish filaments; pistil green with obtuse stigma-lobes; seeds 1 mm. long, tuberculate.

M. E. Eaton del.

1. Top of flowering plant of *Echinocereus pentalophus*.
2. Flowering plant of *Echinocereus fitchii*.
3. Top of flowering plant of *Echinocereus grandis*.
4. Flowering plant of *Echinocereus blanckii*.

(All natural size.)

A. Hoen & Co

Type locality: Hills near San José del Cabo, Lower California.

Distribution: Southern end of Lower California.

This species was first collected by Mr. T. S. Brandegee near San José del Cabo, Lower California, in April 1897, and described by Mrs. Brandegee in 1904 as a new species of *Cereus* of the subgenus *Echinocereus*.

In 1911 Dr. Rose re-collected it in some abundance at the type locality, and living plants were grown in the cactus collections in New York, Washington, and St. Louis. So far as we are aware it is not offered in the trade and is rare in living or herbarium collections. It has been collected in recent years also by Dr. C. A. Purpus and the name *Echinocereus sciurus* was incidentally used in referring to his collection (Monatsschr. Kakteenk. 14: 130. 1904).

Plate IV, figure 1, shows a plant collected by Dr. Rose at San José del Cabo, Lower California, in 1911.

29. Echinocereus cinerascens (De Candolle) Rümpler in Förster, Handb. Cact. ed. 2. 786. 1885.

Cereus cinerascens De Candolle, Mém. Mus. Hist. Nat. Paris 17: 116. 1828.
Cereus cinerascens crassior De Candolle, Mém. Mus. Hist. Nat. Paris 17: 116. 1828.
Cereus cinerascens tenuior De Candolle, Mém. Mus. Hist. Nat. Paris 17: 116. 1828.
Cereus deppei Salm-Dyck, Hort. Dyck. 338. 1834.
Cereus cirrhiferus Labouret, Monogr. Cact. 311. 1853.
Echinocereus cirrhiferus Rümpler in Förster, Handb. Cact. ed. 2. 778. 1885.
Echinocereus glycimorphus Rümpler in Förster, Handb. Cact. ed. 2. 800. 1885.
Cereus glycimorphus Orcutt, Seed Pl. Co. Cat. Cact. 5. 1903.

Growing in patches 6 to 12 dm. broad, branching at base, the stems ascending to about 3 dm.; ribs about 12, not very prominent, obtuse; areoles rather scattered, orbicular; spines white or pale, straight, rough, 1.5 to 2 cm. long; radials about 10; centrals 3 or 4; flowers, including ovary, 6 to 8 cm. long, the tube very short; scales on ovary and tube small, acute, their axils crowded with short white wool and 6 to 8 long white bristles; inner perianth-segments, when dry, deep purple, 3 to 4 cm. long, obtuse; stamens short; fruit not seen.

Type locality: Mexico.

Distribution: Central Mexico.

Cereus aciniformis (Pfeiffer, Enum. Cact. 101. 1837) is only a garden name supposed to be the same as *Echinocereus cinerascens* var. *crassior* (Rümpler in Förster, Handb. Cact. ed. 2. 787. 1885).

Echinocereus deppei, unpublished, belongs here according to Schumann (Monatsschr. Kakteenk. 5: 123. 1895). *Echinocereus cirrhiferus monstrosus* is an abnormal form.

Echinocereus glycimorphus was described from a sterile plant of unknown origin, obtained of F. A. Haage jr. of Erfurt; it was redescribed by Schumann, who cites definitely Mathsson's plant from Hidalgo between Ixmiquilpan and Cardonal, but whether this latter plant is the type or not is uncertain. Schumann made for it a subseries *Oleosi* of which it is the only species.

We feel justified in reducing *E. glycimorphus* to *E. cinerascens;* we have living plants of both from the Berlin Botanical Garden and they must represent essentially the same species, while the differences pointed out by Schumann seem trivial. Not only have we had *Echinocereus cinerascens* from various authentic sources, but Dr. Rose has repeatedly obtained it from the Valley of Mexico and adjacent regions. The plant is of wide distribution and has been reported from farther south than any of the other species of this genus.

Echinocereus undulatus Hildmann (Schumann, Gesamtb. Kakteen 261. 1898) is only a catalogue name for it.

Illustration: Monatsschr. Kakteenk. 14: 137.

30. Echinocereus adustus Engelmann in Wislizenus, Mem. Tour North. Mex. 104. 1848.

Echinocereus rufispinus Engelmann in Wislizenus, Mem. Tour North. Mex. 104. 1848.
Echinocereus radians Engelmann in Wislizenus, Mem. Tour North. Mex. 105. 1848.
Cereus adustus Engelmann in Gray, Pl. Fendl. 50. 1849.
Cereus rufispinus Engelmann in Gray, Pl. Fendl. 50. 1849.

Cereus pectinatus armatus Poselger, Allg. Gartenz. 21: 134. 1853.
Cereus pectinatus spinosus Coulter, Contr. U. S. Nat. Herb. 3: 387. 1896.
Cereus adustus radians Coulter, Contr. U. S. Nat. Herb. 3: 387. 1896.
Echinocereus pectinatus adustus Schumann, Gesamtb. Kakteen 271. 1898.
Echinocereus pectinatus armatus Schumann, Gesamtb. Kakteen 271. 1898.
Echinocereus pectinatus rufispinus Schumann, Gesamtb. Kakteen 272. 1898.

Simple, short-cylindric, often only 4 to 6 cm. high; ribs 13 to 15; areoles closely set, elliptic; radial spines 16 to 20, appressed-pectinate, pale; the central spines wanting or solitary, sometimes elongated and porrect; flowers purplish, 3 to 4 cm. long; inner perianth-segments narrow; ovary and calyx-tube covered with clusters of short brown spines and long wool.

Type locality: Cosihuiriachi, Chihauhua.

Distribution: Mountains near type locality.

Figure 22 is from a photograph of a plant collected by Dr. Rose at the type locality in 1908.

FIG. 22.—Echinocereus adustus.

FIG. 23.—Echinocereus standleyi.

31. Echinocereus standleyi sp. nov.

Nearly globular or short-cylindric, 4 to 5 cm. in diameter; ribs 12; areoles elongated, closely set; radial spines about 16, stoutish, whitish but yellow at base; central spine one, similar to but much larger and stouter than the radials, 2 to 2.5 cm. long, porrect.

Collected by Mrs. S. L. Pattison in the Sacramento Mountains, New Mexico, and obtained from her by Mr. Paul C. Standley in 1906.

It is a little known species, resembling *Echinocereus adustus* and *E. viridiflorus*, but with different spines; neither flower nor fruit has been obtained.

Figure 23 is from a photograph of the type specimen, preserved in the U. S. National Herbarium.

32. Echinocereus perbellus sp. nov.

Stem either simple or clustered, 5 to 10 cm. high; ribs 15, low and broad; distance between the areoles about equal to the length of the areoles themselves; areoles elongated; spines all radials, 12 to 15, spreading but not widely, 5 to 7 mm. long, pale brown to reddish or nearly white below; flowers purple, 4 to 6 cm. long; perianth-segments broad, oblong to oblanceolate, acuminate, nearly 4 cm. long; areoles on flower-tube very woolly as well as spiny.

Collected by Rose and Standley at Big Springs, Texas, February 23, 1910 (No. 12215).

This is a very beautiful species which flowers abundantly in cultivation. If heretofore collected, it has doubtless passed as the next species to which it is related. Rose and Standley, who discovered it wild in 1910, also found it in cultivation in Texas.

Figure 24 is from a photograph of the type specimen.

FIG. 24.—Echinocereus perbellus.

33. Echinocereus reichenbachii* (Terscheck) Haage jr., Index Kewensis 2: 813. 1893.

Echinocactus reichenbachii Terscheck in Walpers, Repert. Bot. 2: 320. 1843.
Cereus caespitosus Engelmann, Bost. Journ. Nat. Hist. 5: 247. 1845.
Echinopsis pectinata reichenbachiana Salm-Dyck, Cact. Hort. Dyck. 1844. 26. 1845.
Echinocereus caespitosus Engelmann in Wislizenus, Mem. Tour North. Mex. 110. 1848.
Cereus caespitosus castaneus Engelmann, Bost. Journ. Nat. Hist. 6: 203. 1850.
Cereus reichenbachianus Labouret, Monogr. Cact. 318. 1853.
Cereus reichenbachianus castaneus Labouret, Monogr. Cact. 319. 1853.
Cereus caespitosus minor Engelmann, Proc. Amer. Acad. 3: 280. 1856.
Cereus caespitosus major Engelmann, Proc. Amer. Acad. 3: 280. 1856.
Echinocereus texensis Jacobi, Allg. Gartenz. 24: 110. 1856.
Mammillaria caespitosa A. Gray, First Lessons in Botany 96. 1857.
Echinocereus rotatus Linke, Wochenschr. Gärtn. Pflanz. 1: 85. 1858.
Echinocereus caespitosus castaneus Rümpler in Förster, Handb. Cact. ed. 2. 811. 1885.
Echinocereus caespitosus major Rümpler in Förster, Handb. Cact. ed. 2. 811. 1885.
Echinocereus pectinatus caespitosus Schumann, Gesamtb. Kakteen 272. 1898.

More or less cespitose; stems simple, globose to short-cylindric, 2.5 to 20 cm. long, 5 to 9 cm in diameter; ribs 12 to 19; areoles approximate, elliptic; spines 20 to 30, white to brown, but usually those of each individual plant of one color, pectinate, interlocking, 5 to 8 mm. long, spreading, more or less recurved; centrals 1 or 2, like the radials, or often wanting; flowers fragrant, rather variable as to size, often 6 to 7 cm. long and fully as broad, opening during the day, always closing at night and sometimes opening the second day, light purple, often reflexed; perianth-segments narrow, the margin more or less erose; filaments pinkish; fruit ovoid, about 1 cm. long; seeds black, nearly globose, 1.2 to 1.4 mm. in diameter.

FIG. 25.—Echinocereus reichenbachii.

Type locality: Mexico.

Distribution: Texas and northern Mexico; recorded from western Kansas.

The plant grows in a limestone country, usually among rocks.

Brandegee in 1876 reported *Cereus caespitosus castaneus* from the mesas of Saint Charles, south of Pueblo, Colorado, but we have seen no specimens. The species is not credited to Colorado in recent manuals. We have seen specimens from as far south as Saltillo, Mexico (Runyon, 1921).

Cereus concolor Schott (Pac. R. Rep. 4: Errata and Notes 11. 1856) is referred here by Coulter. The original description indicates a very different plant and it is surprising

* According to Walpers, the specific name is *reichenbachii*, but Labouret, when he transferred it to *Cereus*, changed it to *reichenbachianus* and this spelling is used in the Index Kewensis where the plant is taken up under *Echinocereus*. There the binomial is credited to Engelmann.

that it has not been re-collected. It was collected at Escondido Springs, near the Pecos, Texas. Schott points out how it differs from *Echinocereus caespitosus* in the following words:

"In *C. caespitosus* the flower-buds are clothed with a dense grayish wool and bear beautiful flowers 2 inches in diameter and 2 inches in length. In *Cereus concolor* the flower-buds are perfectly naked, small, campanulate blossoms with yellowish sanguineus petals perfectly like the spines in color, 0.5 inches in diameter and 0.8 inches in length."

Echinopsis reichenbachiana Pfeiffer (Förster, Handb. Cact. 365. 1846) was used only as a synonym.

Echinocereus pectinatus castaneus (Monatsschr. Kakteenk. 1: 144. 1891), unpublished, doubtless belongs here.

Illustrations: Gray, First Lessons Bot. 96; Gray, Struct. Bot. ed. 5. 421. f. 838; ed. 6. 170. f. 317, as *Mammillaria caespitosa**; West Amer. Sci. 7: 238; Dict. Gard. Nicholson 4: 511. f. 6; Suppl. 217. f. 228; Cact. Mex. Bound. pl. 43, 44; Deutsche Gärt. Zeit. 5: 209; Watson, Cact. Cult. f. 19; Curtis's Bot. Mag. 109: pl. 6669; Gartenflora 29: 52, as *Cereus caespitosus;* Gartenflora 30: 413; Garten-Zeitung 3: 16. f. 7; Engler and Prantl, Pflanzenfam. 3^{6a}: f. 56, F; Förster, Handb. Cact. ed. 2. f. 105, 138; Cact. Journ. 1: 107, 135; Britton and Brown, Illustr. Fl. 2: 461. f. 2523; ed. 2. 2: 559. f. 2982; Rümpler, Sukkulenten 140. f. 75; Ann. Rep. Smiths. Inst. 1908: pl. 4, f. 6, as *Echinocereus caespitosus;* Monatsschr. Kakteenk. 15: 171; Floralia 42: 369, as *Echinocereus pectinatus caespitosus.*

Figure 26 is copied from plate 43 of the Mexican Boundary Survey, above cited; figure 25 is from a photograph furnished by Robert Runyon of a plant collected near Saltillo, Mexico.

34. **Echinocereus baileyi** Rose, Contr. U. S. Nat. Herb. 12: 403. 1909.

Plant body cylindric, about 10 cm. high; ribs 15, straight or sometimes spiral; areoles elongated, separated from the adjacent ones by a space of about their own length; radial spines at first white, when mature brownish or yellowish, about 16, somewhat spreading, those at the top and base of the areole smaller; central spines none; areoles when young clothed with dense white wool, this nearly or quite wanting in age; flowers from the youngest growth appearing terminal; perianth widely spreading, 6 cm. broad or more; inner segments light purple, oblong to spatulate-oblong, the broad apex toothed or erose, the terminal teeth tapering into a slender awn; filaments short, yellow; style stout, longer than the filaments; stigma-lobes 10, obtuse; areoles of the ovary bearing 10 to 12 slender spines intermixed with cobwebby wool, the spines whitish or the central ones brownish; areoles of the tube crowning an elongated tubercle, not so closely set, bearing spines subtended by minute leaves.

Type locality: Wichita Mountains, Oklahoma.

Distribution: Mountains of Oklahoma.

This very interesting species was collected in August 1906 by Mr. Vernon Bailey, for whom it was named, in the Wichita Mountains, Oklahoma. The following August it flowered and then died. Until recently we supposed that this was the only collection known but, while restudying the genus, we find that a plant sent by a Mr. Merkel from Oklahoma flowered in July 1908. We have since endeavored to collect specimens, but without success until we were reading the second proof. On Major E. A. Goldman's return from Oklahoma in August 1921 he informed us that *Echinocereus baileyi* was very common in the Wichita National Forest near Cache and he arranged with the forest super-

* On inquiring of Miss Mary A. Day regarding these references we received the following reply under date of June 15, 1921:

"The name *Mammillaria caespitosa* used by Dr. Gray in his Structural Botany, edition 5, 1858, appears one year earlier in his First Lessons in Botany and Vegetable Physiology, page 96, 1857. This is the earliest reference I find for it. In the foot-note at the bottom of the page where this name is given, Dr. Gray himself has crossed out *Mammillaria caespitosa* and written in *Cereus caespitosus.* He has also crossed off the words 'Upper Missouri,' and written in 'Texas.' This would indicate that Dr. Gray himself considered the name *Mammillaria caespitosa,* or the figure of it in his First Lessons, and Structural Botany, the same as Engelmann's *Cereus caespitosus* of Texas."

visor, Mr. Frank Rush, to have living plants sent on to Washington. These arrived in November. Besides several single plants there was a large clump, 3 dm. in diameter, consisting of 25 branches.

Illustrations: Contr. U. S. Nat. Herb. 12: pl. 56, 57.

Figure 27 is a copy of the first illustration above cited.

FIG. 26.—Echinocereus reichenbachii.

FIG. 27.—Echinocereus baileyi.

35. Echinocereus rigidissimus (Engelmann) Rose, Contr. U. S. Nat. Herb. 12: 293. 1909.

Cereus pectinatus rigidissimus Engelmann, Proc. Amer. Acad. 3: 279. 1856.
Echinocereus pectinatus rigidissimus Rümpler in Förster, Handb. Cact. ed. 2. 818. 1885.
Echinocereus pectinatus robustus Bauer, Gartenflora 39: 513. 1890.

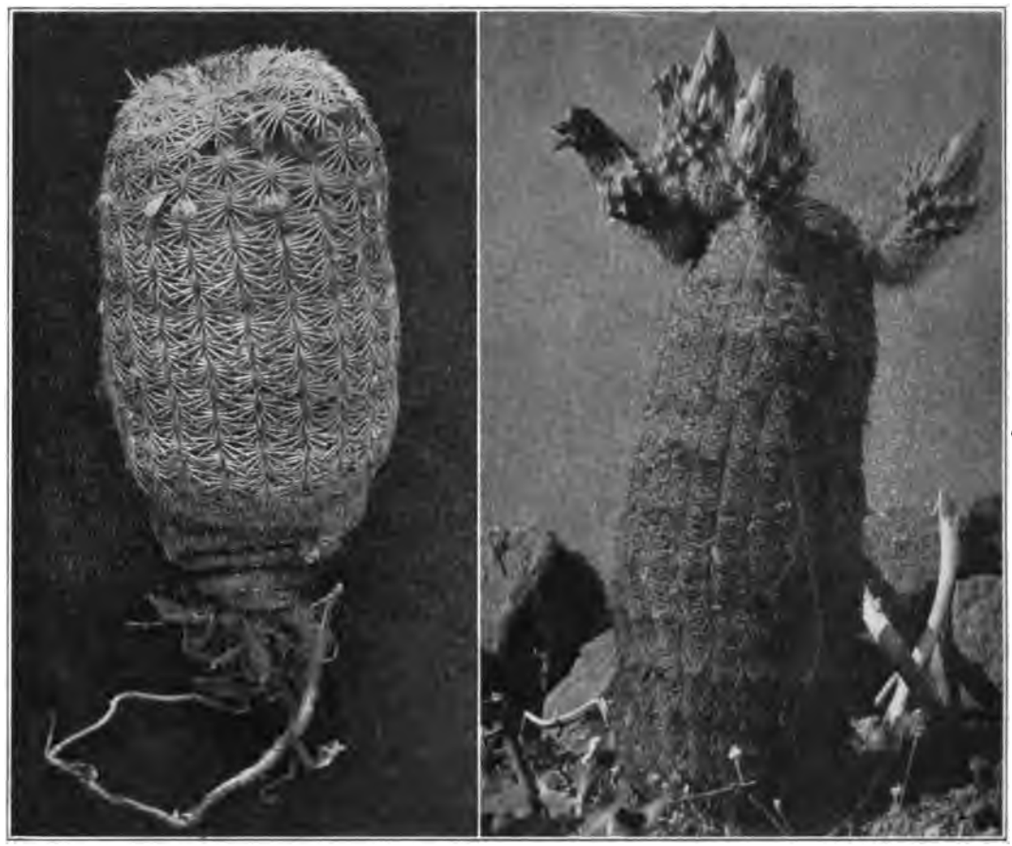
Plants simple, erect, rigid, short-cylindric, 1 to 2 dm. high, 4 to 10 cm. in diameter, usually hidden by the closely set interlocking spines; ribs numerous, 18 to 22, low; areoles approximate, elliptic, 5 to 6 mm. long; radial spines about 16, gray to reddish brown, arranged in horizontal bands, pectinate, rigid, 15 mm. long or less, often recurved; central spines none; flowers purple, 6 to 7 cm. long, fully as broad when expanded; perianth-segments oblong, 3 to 4 cm. long, acute; stamens numerous, shorter than the style; areoles on ovary somewhat floccose, very spiny; fruit globular, 3 cm. in diameter, very spiny; seeds black, tuberculate, 1.5 mm. in diameter.

Type locality: Sonora.

Distribution: Southeastern Arizona and northern Sonora.

This species is a great favorite in collections, although it does not last long. Its varicolored spines arranged in bands have given it the appropriate name of rainbow cactus,

while in Mexico it is called cabeza del viego. It has often been regarded as a variety of *E. reichenbachii*, but it is abundantly distinct. It is known in the trade under various names, among which are *Cereus candicans* and *Echinocereus candicans*, a name which belongs properly to a very different plant from Argentina, *Cereus rigidissimus*, *C. robustior*, and *Echinocereus robustior*, but none of which has been formally published. Here also belong the names *Echinocereus rigidispinus*, *E. pectinatus robustior* (Monatsschr. Kakteenk. 7: 95. 1897), and perhaps *E. pectinatus candicans* (Monatsschr. Kakeenk. 3: 111. 1893).



FIGS. 28 and 29.—Echinocereus rigidissimus.

The largest specimen which we have seen was collected by Dr. J. W. Gidley near Benson, Arizona, in 1921. This plant was fully 2 dm. tall and 1 dm. in diameter. The spines were nearly all red, separated by very narrow bands of white ones giving the plant a brilliant and striking appearance.

Illustrations: Cycl. Amer. Hort. Bailey 2: 519. f. 748; De Laet, Cat. Gén. f. 36; Schelle, Handb. Kakteenk. 133. f. 63, as *Echinocereus pectinatus rigidissimus;* Gartenflora 39: pl. 1331, as *E. pectinatus robustus;* Cact. Journ. 1: pl. for September; 2: 18; (?) Balt. Cact. Journ. 2: 88; West Amer. Sci. 7: 236, as *Echinocereus candicans;* Stand. Cycl. Hort. Bailey 2: f. 1376.

Figure 28 is from a photograph of a plant sent from Sonora, Mexico, by Carl Lumholtz in 1909; figures 29 and 30 are from photographs taken by F. E. Lloyd at the Desert Laboratory of the Carnegie Institution, Tucson, Arizona; figure 31 is from a photograph of a plant in its natural habitat, taken by Dr. MacDougal at Calabasas, Arizona, in 1908.

36. Echinocereus weinbergii Weingart, Monatsschr. Kakteenk. **22**: 83. 1912.

Very stout, usually simple, at first globose, becoming conical, at least in cultivation, 13 cm. in diameter; ribs 15, acute, more or less undulate; areoles elliptic, approximate; radial spines 9 to 12, pectinate, 3 to 12 mm. long, at first white or rose but in age yellowish; central spines none; flowers diurnal, 3.6 cm. broad, rose-colored; inner perianth-segments in several series, 1.5 to 3 cm. long, 4 to 5 mm. broad, lanceolate, acuminate; fruit not known.

FIGS. 30 and 31.—Echinocereus rigidissimus.

Type locality: Not cited.

Distribution: Doubtless Mexico, but known only from garden plants.

This is one of the stoutest plants of the genus known to us. It was named in honor of Frank Weinberg, a cactus dealer.

Illustration: Monatsschr. Kakteenk. **24**: 105.

Figure 32 is from a photograph contributed by Mr. Frank Weinberg.

FIG. 32.—Echinocereus weinbergii.

37. Echinocereus pectinatus (Scheidweiler) Engelmann in Wislizenus, Mem. Tour North. Mex. 109. 1848.

Echinocactus pectinatus Scheidweiler, Bull. Acad. Sci. Brux. **5**: 492. 1838.
Echinocactus pectiniferus Lemaire, Cact. Gen. Nov. Sp. 25. 1839.
Echinocactus pectiniferus laevior Monville in Lemaire, Cact. Gen. Nov. Sp. 26. 1839.
Echinopsis pectinata Fennel, Allg. Gartenz. **11**: 282. 1843.
Cereus pectinatus Engelmann in Gray, Pl. Fendl. 50. 1849.
Cereus pectiniferus Labouret, Monogr. Cact. 320. 1853.
Echinocereus pectinatus chrysacanthus Schumann, Gesamtb. Kakteen 272. 1898.

Plants simple, erect, cylindric, 1 to 1.5 dm. long, 3 to 6 cm. in diameter, almost hidden by the many short interlocking spines; ribs 20 to 22, usually straight; areoles approximate, but not touching one another, elliptic, 3 mm. long; radial spines about 30, pectinate, usually much less than 10 mm. long, white or rose-colored, the colors more or less in bands about the plant; central spines several, more or less porrect; flowers purplish, 6 to 8 cm. long; areoles on ovary and flower-tube felted, very spiny; fruit spiny, becoming naked, 2 to 3 cm. in diameter.

Type locality: Near Villa del Pennasco, central Mexico.

Distribution: Central Mexico.

This species was first collected by Galeotti who sent a collection to Belgium from the states of San Luis Potosí and Guanajuato, Mexico. The type station, Villa del Pennasco, we have not located. It was soon after figured by Lemaire (Icon. Cact. pl. 14 or 15) and

Pfeiffer (Abbild. Beschr. Cact. 2: pl. 10), very likely from the type collection. These illustrations are not very good, especially as to the areoles. In 1845 it was again described and illustrated, this time in Curtis's Botanical Magazine, plate 4190, from a specimen sent by a Mr. Staines from San Luis Potosí. This is from the region of Galeotti's type. We refer here Lloyd's No. 4 from Zacatecas.

Cereus pectinatus laevior Salm-Dyck (Cact. Hort. Dyck. 1849. 43. 1850; *Echinocereus pectinatus laevior*, Monatsschr. Kakteenk. Index 56. 1912) is only a name to be referred here. *Echinocereus pectinatus cristatus* is an abnormal form of no taxonomic importance. A very unusual illustration of it appeared in Floralia 42: 372. This variety may or may not belong to this species. *Echinopsis pectinata laevior* Monville (Förster, Handb. Cact. 365. 1846) belongs here.

Illustrations: Curtis's Bot. Mag. 71: pl. 4190; Lemaire, Icon. Cact.* pl. 14 or 15; Loudon, Encycl. Pl. ed. 3, 1377. f. 19371; Fl. Serr. 2: July, pl. 7, as *Echinocactus pectiniferus;* Pfeiffer, Abbild. Beschr. Cact. 2: pl. 10, as *Echinopsis pectinata;* Cact. Journ. 2: 18; Förster, Handb. Cact. ed. 2. f. 108; Rümpler, Sukkulenten 141. f. 76; Ann. Rep. Smiths. Inst. 1908: pl. 2, f. 6; Schelle, Handb. Kakteenk, 132. f. 62.

Figure 33 is copied from the first illustration cited above.

FIG. 33.—Echinocereus pectinatus.

38. Echinocereus fitchii sp. nov.

Plants short-cylindric or somewhat narrowed above, 8 to 10 cm. long, 4 to 5 cm. in diameter; ribs 10 to 12, low, rounded; areoles 4 to 6 mm. apart, small, circular; radial spines about 20, white, spreading, 4 to 6 mm. long; central spines 4 to 6, slightly spreading, 12 mm. long or less, acicular, brownish, but sometimes white at base; flowers 6 to 7 cm. long, pink; perianth-segments, oblanceolate, widely spreading, acute, serrate on the margin; ovary 2.5 cm. long, bearing numerous areoles, these spiny and with cobwebby hairs.

Living specimens were collected by Dr. Rose near Laredo, Texas, in 1913 (No. 18037) which flowered in the New York Botanical Garden, April 10, 1914.

This plant is named for Mr. William R. Fitch who accompanied Dr. Rose on collecting trips to the West Indies and to western Texas in 1913.

Plate III, figure 2, is of the type plant cited above.

39. Echinocereus scopulorum sp. nov.

Stems single, cylindric, 10 to 40 cm. long, nearly hidden by the closely set spines; ribs 13 or more, low, somewhat tuberculate; areoles circular, devoid of wool (at least in areoles of the previous year); spines highly colored, pinkish or brownish with blackish tips, in age, however, gray and stouter; radials somewhat spreading; centrals 3 to 6, similar to the radials; flower-buds or some of them appearing near the top of the plant, developing very slowly; flowers with a delicate rose perfume, widely spreading when fully expanded, 9 cm. broad; tube 2 cm. long, broadly funnelform, bearing greenish tubercles; inner perianth-segments 4 cm. long, rose or purplish rose in color, much paler on the outside, sometimes nearly white, rather loose and usually only in about 2 rows, oblanceolate to spatulate, erosely dentate, acute; stamens greenish; style stout, much longer than the stamens; stigma-lobes linear, 12.

* See Britton and Rose, Cactaceae 2: 6. 1920.

Collected near Guaymas, Mexico, March 10, 1910, by Rose, Standley, and Russell (No. 12570, type), and by Ivan M. Johnston, April 14, 1921 (No. 3103). It also was found as far south as Topolabampo, Sinaloa, March 23, 1910, by Rose, Standley, and Russell (No. 13349) and at San Pedro Bay, Sonora (No. 4291), and at San Carlos Bay, Sonora (No. 4344), by Mr. Johnston in 1921.

It is related to *E. reichenbachii*, but is very distinct from it.

Mr. Johnston's No. 3103 flowered in Washington, July 22, 1921.

Figure 34 is from a photograph made in Washington from a living plant collected by Rose, Standley, and Russell at Topolabampo, Mexico.

FIG. 34.—Echinocereus scopulorum.

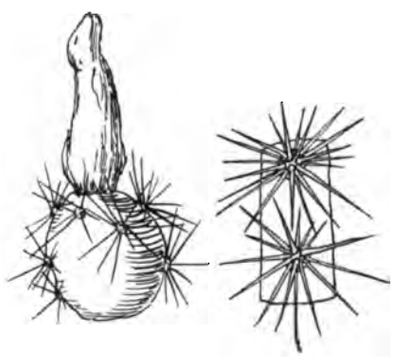
40. Echinocereus roetteri (Engelmann) Rümpler in Förster, Handb. Cact. ed. 2. 829. 1885.

Cereus dasyacanthus minor Engelmann, Proc. Amer. Acad. 3: 279. 1856

Cereus roetteri Engelmann, Proc. Amer. Acad. 3: 345. 1856.

Echinocereus kunzei Gürke, Monatsschr. Kakteenk. 17: 103. 1907.

Cespitose, or perhaps sometimes simple and occasionally budding above, 1 to 2.5 dm. high; ribs 13, straight, more or less undulate; areoles circular, or a little longer than broad, about 1 cm. apart; radial spines 15 to 17, acicular, about 1 cm. long, white or purplish; central spines 1 to 5, not in a single row, a little stouter but scarcely longer than the radials; flowers appearing below the top of the plant, large, 6 to 7 cm. long, perhaps even broader than long, light purple; outer perianth-segments greenish yellow; inner perianth-segments oblanceolate, acute, 3 to 4 cm. long; ovary and fruit spiny.



FIGS. 35 and 36.—Flower and spine-clusters of Echinocereus roetteri. X0.9.

Type locality: Near El Paso, Texas.

Distribution: Southwestern Texas; Chihuahua, near El Paso, and southeastern New Mexico.

Echinocereus kunzei which we have referred here as a synonym is usually stated to be from Arizona. It was doubtless sent out from Phoenix, Arizona, where Dr. Kunze lived, but we have a specimen in the U. S. National Herbarium labeled "southern New Mexico" in Dr. Kunze's handwriting. The illustration which Dr. Kunze uses (Price List of Cactaceae, 1913) suggests *Echinocereus viridiflorus*.

According to Engelmann it is similar to *E. dasyacanthus* from which it is distinguished by its fewer ribs, stouter spines, purple flowers, smaller fruit, and larger seed.

This species was named for Paulus Roetter, the artist, who made the cactus drawings for the Mexican Boundary Survey.

Illustrations: Cact. Mex. Bound. pl. 41, f. 3 to 5, as *Cereus roetteri;* Blühende Kakteen 3: pl. 128, as *Echinocereus kunzei.*

Figures 35 and 36 are drawn from a co-type herbarium specimen collected by Charles Wright in New Mexico, 1851–1852.

41. Echinocereus chlorophthalmus (Hooker) Britton and Rose, Contr. U. S. Nat. Herb. **16**: 242. 1913.

Echinocactus chlorophthalmus Hooker in Curtis's Bot. Mag. **74**: pl. 4373. 1848.

Cespitose, nearly globose, glaucous-green; ribs 10 to 12, somewhat tuberculate; areoles circular; radial spines 7 to 10, slender, needle-like, 12 to 18 mm. long, spreading; central spine one, stouter than the radials, the central as well as the radials pale brown but reddish at base when young; inner perianth-segments spatulate, acute, somewhat serrate towards the tip, glossy above, purple, whitish at base; stigma-lobes bright green; ovary and fruit spiny.

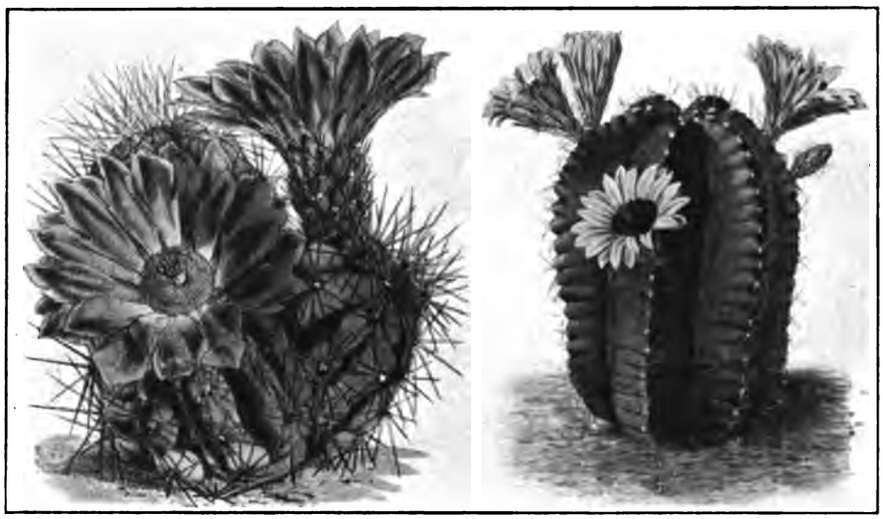


FIG. 37.—Echinocereus chlorophthalmus. FIG. 38.—Echinocereus knippelianus.

Type locality: Real del Monte, Mexico.

Distribution: Known only from the type locality.

This species, although described as an *Echinocactus*, is undoubtedly an *Echinocereus*, but it is not near *Echinocereus conglomeratus* as Schumann suggests.

In 1905 Dr. Rose visited Real del Monte, the type locality, where he collected the flowers of an *Echinocereus* (No. 8730) which correspond very well to the cited illustrations.

Illustrations: Curtis's Bot. Mag. **74**: pl. 4373; Loudon, Encycl. Pl. ed. 3. 1377. f. 19374, as *Echinocactus chlorophthalmus*.

Figure 37 is copied from the first illustration above cited.

42. Echinocereus knippelianus Liebner, Monatsschr. Kakteenk. **5**: 170. 1895.

Echinocereus liebnerianus Carp,* Balt. Cact. Journ. **2**: 262. 1896.†
Echinocereus inermis Haage jr., Monatsschr. Kakteenk. **8**: 130. 1898.
Cereus knippelianus Orcutt, West Amer. Sci. **13**: 27. 1902.

*The authority for this name was given as Carp or as an abbreviation, Carp., which suggested that it might be an abbreviation for Carpenter, but as there was no cactus authority of this name the explanation seemed unsatisfactory. It was known that various short articles appeared in the Baltimore Cactus Journal under this name with a California address. This led us to write to C. R. Orcutt and then to Ernest Braunton, both of whom have long been in touch with horticultural interests in California. From them we obtained the following information:

Carp's real name was Daniel R. Crane. At one time he was a dealer of cacti and advertised freely under the name of the California Cactus Company, Soldiers' Home, Los Angeles County, California. His pen name, he explained, was a reversal of the first syllable of practical, which is of doubtful significance. Crane served in the Union Army and was somewhat erratic in his later years. He died about 1901.

†This reference is taken from Schumann (Gesamtb. Kakteen 252. 1897) who cites Carp as the authority for this binomial. The original publication of *E. liebnerianus* does not refer to Carp but to Liebner. It occurs in the following letter of K. Schumann to the editor of the Baltimore Cactus Journal (**2**: 262. 1896):

"The cactus found by McDowell and pictured twice in the November number of the Baltimore Cactus Journal is described in the November number of the Monatsschrift für Kakteenkunde and named by Mr. C. Liebner, *Echinocereus liebnerianus*."

At first simple, stout, a little higher than broad, about 10 cm. high, but in cultivation elongated, 20 cm. high or more, branching, very deep green, becoming turgid and flabby; ribs 5 to 7, more prominent towards the top of the plant, sometimes strongly tuberculate, at other times only slightly sinuate; areoles minute, white-felted, 5 to 6 mm. apart; spines 1 to 3, weak, 3 to 6 mm. long, yellow; flowers pinkish, 2.5 to 3 cm. long; perianth-segments spreading, oblanceolate, acute; style cream-colored; fruit not known.

Type locality: Not cited.

Distribution: Mexico, but range unknown.

The origin of this species is unknown but it is supposed to have come from Mexico. It is not uncommon in European collections and Dr. Rose studied it in Berlin in 1912. At one time we had it in our collection but it has since disappeared; otherwise the plant is known to us only from the descriptions and illustrations.

This species is doubtless named for Karl Knippel, a well-known dealer in cacti.

Illustrations: Schumann, Gesamtb. Kakteen f. 47; Monatsschr. Kakteenk. **5**: 170; Blühende Kakteen **1**: pl. 12; Schelle, Handb. Kakteenk. 120. f. 54; Balt. Cact. Journ. 2: 215, 228. f. 3; Kirtcht, Kakteen Zimmergarten 57.

Figure 38 is copied from the third illustration above cited.

43. Echinocereus pulchellus (Martius) Schumann in Engler and Prantl, Pflanzenfam. 3^{6a}: 185. 1894.

Echinocactus pulchellus Martius, Nov. Act. Nat. Cur. **16**: 342. 1828.
Cereus pulchellus Pfeiffer, Enum. Cact. 74. 1837.
Echinonyctanthus pulchellus Lemaire, Cact. Gen. Nov. Sp. 85. 1839.
Echinopsis pulchella Zuccarini in Förster, Handb. Cact. 363. 1846.

Stems obovate-cylindric, 5 to 7 cm. high, simple, glaucous; ribs 12, obtuse, more or less divided into tubercles; spines 3 to 5, short, straight, deciduous, yellowish; flowers rosy-white, about 4 cm. broad; inner perianth-segments lanceolate, acuminate.

FIG. 39.—Echinocereus pulchellus.

FIG. 40.—Echinocereus amoenus.

Type locality: Pachuca, Mexico, *fide* Pfeiffer.

Distribution: Probably central Mexico.

This species is known to us only from descriptions and illustrations, but it seems quite distinct.

Illustrations: Nov. Act. Nat. Cur. **16**: pl. 23, f. 2, as *Echinocactus pulchellus;* Blühende Kakteen **1**: pl. 33; Monatsschr. Kakteenk. **26**: 177.

Figure 39 is copied from the first illustration above cited.

44. Echinocereus amoenus (Dietrich) Schumann in Engler and Prantl, Pflanzenfam. 3^{6a}: 185. 1894.

Echinopsis amoena Dietrich, Allg. Gartenz. **12**: 187. 1844.
Echinopsis pulchella amoena Förster, Handb. Cact. 364. 1846.
Cereus amoenus Hemsley, Biol. Centr. Amer. Bot. **1**: 540. 1880.
Echinocereus pulchellus amoenus Schumann, Gesamtb. Kakteen 253. 1897.

Plants low, almost buried in the ground; ribs usually 13, low, somewhat tuberculate; young areoles bearing 6 to 8 rather stout, short, spreading spines; old areoles spineless; flowers about 5 cm. broad, magenta-colored; inner perianth-segments spatulate, with an ovate acute tip; filaments rose-colored; areoles of the ovary and flower-tube bearing brown spines and cobwebby wool.

Type locality: Mexico.

Distribution: San Luis Potosí, Mexico.

This plant has recently been introduced into Europe in great quantities. It is rather inconspicuous, but has very pretty flowers.

Echinopsis pulchella rosea (Labouret, Monogr. Cact. 292. 1853) was given as a synonym of the species.

Illustration: Monatsschr. Kakteenk. 3: 171. f. 4, as *Echinopsis amoena*.

Figure 40 is from a photograph of a plant sent from San Luis Potosí, Mexico, by Mrs. Irene Vera.

45. Echinocereus palmeri sp. nov.

Plants small, 5 to 8 cm. high, 2 to 3 cm. in diameter; areoles closely set, round; radial spines 12 to 15, spreading, slender, brown-tipped; central spine one, porrect, 15 to 20 mm. long, brown to blackish; flower 3.5 cm. long, purple; areoles on the ovary bearing a cluster of brown spines and white wool.

Collected by Dr. E. Palmer on a small hill near Chihuahua City, April 1908 (No. 121). Only three specimens were seen, of which one was in flower.

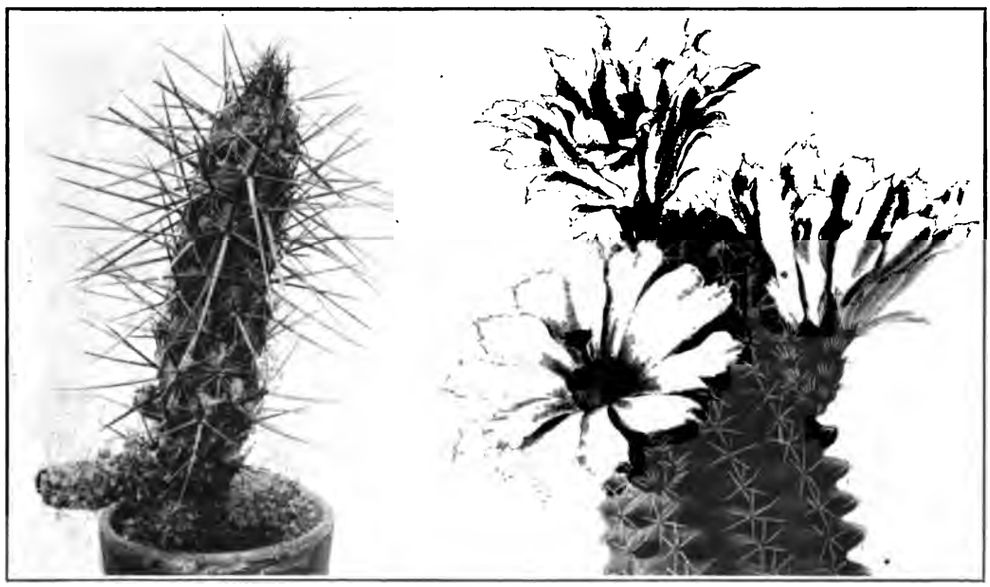


FIG. 41.—Echinocereus brandegeei. FIG. 42.—Echinocereus hempelii.

46. Echinocereus brandegeei (Coulter) Schumann, Gesamtb. Kakteen 290. 1898.

Cereus brandegeei Coulter, Contr. U. S. Nat. Herb. 3: 389. 1896.
Cereus sanborgianus Coulter, Contr. U. S. Nat. Herb. 3: 391. 1896.
Echinocereus sanborgianus Schumann, Gesamtb. Kakteen 274. 1898.

Always growing in clumps; joints sometimes one meter long or more, 5 cm. in diameter, but usually much narrowed toward the base; ribs strongly tubercled; areoles circular; spines at first light yellow tinged with red, in age dark gray; radial spines about 12, spreading, acicular; central spines usually 4, very much stouter, more or less flattened, erect or porrect, the lowest one decidedly so, sometimes 8 cm. long; flowers purplish, about 5 cm. long; areoles on ovary and tube closely set, filled with pale acicular spines and long white wool; fruit globular, 3 cm. in diameter, spiny; seeds black, tuberculately roughened.

Type locality: El Campo Allemand, Lower California.

Distribution: Very common on the low hills along the coast of southern Lower California and adjacent islands.

The species is named for Townsend S. Brandegee, a well-known botanical collector and writer.

Illustration: Contr. U. S. Nat. Herb. **16**: pl. 124.

Figure 41 is from a photograph of a plant collected by Dr. Rose at the head of Concepción Bay, Lower California, in 1911 (No. 16672).

47. Echinocereus hempelii Fobe, Monatsschr. Kakteenk. **7**: 187. 1897.

Plant, so far as known, simple, erect, 1.5 dm. long or more, 6 to 7 cm. in diameter, dark green; ribs 10, strongly tuberculate; radial spines 6, spreading, white with brown tips, acicular, 1 cm. long or less; central spines none; flowers from near the top of plant, rather large, 6 to 8 cm. broad, violet; inner perianth-segments few, about 14, loosely arranged, oblong, 3 cm. long, strongly toothed above; style longer than the stamens; ovary bearing conspicuous red scales, spiny; fruit not known.

Type locality: Mexico.

Distribution: Known only from cultivated plants.

In 1912 Dr. Rose studied this plant in Berlin and thought it might be a form of *E. fendleri* but it has since been illustrated in color and shows some striking differences, as, for instance, its lack of central spines, the strongly tubercled ribs and the very loosely arranged perianth-segments.

This species was named for George Hempel (1847–1904) who collected in Mexico and South America.

Illustrations: Monatsschr. Kakteenk. **7**: 185; Blühende Kakteen 3: pl. 142.

Figure 42 is copied from the second illustration above cited.

48. Echinocereus merkeri Hildmann in Schumann, Gesamtb. Kakteen 277. 1898.

Cereus merkeri Berger, Rep. Mo. Bot. Gard. **16**: 81. 1905.

Cespitose; joints erect, 12 to 15 cm. in diameter, light green; ribs 8 or 9, sinuate; radial spines 6 to 9, white, shining; central spines 1 or rarely 2, often yellowish, larger than the radials, red at base; flowers purple, about 6 cm. long; inner perianth-segments short-oblong, 3 cm. long, rounded at apex, sometimes mucronate; scales on ovary 2 to 3 cm. long, ovate, acuminate, bearing 2 to 5 long spiny bristles in their axils.

Type locality: Not cited.

Distribution: Durango to Coahuila and San Luis Potosí, Mexico.

In the original description several localities in Durango and Coahuila are assigned for this species and it is possible that some other species was confused with it.

To this species we refer Palmer's herbarium specimens from Saltillo, Mexico, 1905 (No. 510), and C. A. Purpus's specimen from northern Mexico; the latter we have living also, and it is unlike any other plant in our collections.

Echinocereus jacobyi (Schumann, Gesamtb. Kakteen 278. 1898), undescribed, belongs here.

Figure 43 is from a photograph of a plant collected by Dr. C. A. Purpus in northern Mexico.

49. Echinocereus fendleri (Engelmann) Rümpler in Förster, Handb. Cact. ed. 2. 801. 1885.

Cereus fendleri Engelmann in Gray, Pl. Fendl. 50. 1849.
Cereus fendleri pauperculus Engelmann in Gray, Pl. Fendl. 51. 1849.

Cespitose; stems about 8, ascending or erect, 1 to 3 dm. long, 5 to 7.5 cm. in diameter; ribs rather prominent, 9 to 12, somewhat undulate; spines very variable as to color, length, and form; radial spines 5 to 10, more or less spreading, 1 to 2 cm. long, acicular to subulate; central spine solitary, usually porrect, 4 cm. long or less, dark colored, often black-bulbose at base; flowers borne at the upper part of the plant, often very large, 10 cm. broad when fully expanded, but sometimes

smaller, deep purple; inner perianth-segments spatulate, 3 to 4 cm. long, acute, the margin sometimes serrulate; filaments purple, very short, 1 cm. long or less; style very pale; ovary deep green, its areoles bearing white felt and white bristly spines; fruit ovoid, 2.5 to 3 cm. long, purplish, edible; seeds 1.4 mm. long.

Type locality: Near Santa Fé, New Mexico.

Distribution: Texas to Utah, Arizona, and northern Sonora and Chihuahua, Mexico.

The species shows considerable variation in armament and in the size of the flowers and, except in its erect habit, much resembles the next following species.

This species was named for August Fendler (1813–1883) who collected extensively in New Mexico and Venezuela.

Related to *Echinocereus fendleri* but growing at higher elevations is a plant obtained by D. T. MacDougal and Forrest Shreve from the eastern side of the Santa Catalina Mountains in March 1921 and again at Oracle, Arizona, May 6, 1921. This plant grows singly or in clumps with 13 to 16 low ribs and short spines. The central spines are from 1 to 4. More detailed field studies may prove this to be a distinct species. Figure 45 may represent this form.

FIG. 43.—Echinocereus merkeri.

FIG. 44.—Echinocereus fendleri.

Echinocereus hildmannii Arendt (Monatsschr. Kakteenk. 1: 146. pl. 11. 1891) should be compared with *E. fendleri.*

Illustrations: Curtis's Bot. Mag. 106: pl. 6533; Cact. Mex. Bound. pl. 51 to 53; Gartenflora 32: 341, as *Cereus fendleri;* Förster, Handb. Cact. ed. 2. f. 104; Plant World 11^{10}: f. 1; Rümpler, Sukkulenten 137. f. 73; Schelle, Handb. Kakteenk. 134. f. 64; Blühende Kakteen 3: pl. 143; Floralia 42: 369.

Plate IV, figure 3, shows a flowering plant sent by W. H. Long to the New York Botanical Garden from Albuquerque, New Mexico, in 1915. Figure 44 is from a photograph taken by Dr. MacDougal in the Tucson Mountains, Arizona, in 1908; figure 45 is from a photograph of a plant collected by Dr. Rose near Benson, Arizona, in 1908.

50. Echinocereus enneacanthus Engelmann in Wislizenus, Mem. Tour North. Mex. 112. 1848.

Cereus enneacanthus Engelmann, Pl. Fendl. 50. 1849.
Echinocereus carnosus Rümpler in Förster, Handb. Cact. ed. 2. 796. 1885.
Echinocereus enneacanthus carnosus Quehl, Monatsschr. Kakteenk. 18: 114. 1908.

Cespitose, with many stems, often forming clumps one meter in diameter or more; joints often elongated, prostrate, 5 to 7 cm. in diameter; ribs 7 or 8, prominent, more or less tuberculate, some-

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1. Top of flowering plant of *Echinocereus sciurus*.
2. Flowering plant of *Lobivia cinnabarina*.
3. Flowering plant of *Echinocereus fendleri*.
4. Top of flowering plant of *Echinocereus lloydii*.
5. Flowering plant of *Rebutia minuscula*.

(All natural size.)

what flabby, dull green; areoles 2.5 cm. apart; radial spines unequal, usually less than 12 mm. long, acicular, at first yellowish, becoming brownish; central spine solitary, usually elongated, nearly terete, 3 to 5 cm. long; flower purple, 7.5 cm. broad; perianth-segments nearly oblong; style cream-colored, a little longer than the stamens; fruit globular, juicy, edible.

Type locality: Near San Pablo, south of Chihuahua, Mexico.

Distribution: Northern Mexico, New Mexico, and southern Texas.

There has always been more or less uncertainty about this species. Engelmann, who described the species in 1848, based it on Wislizenus's specimen which came from near San Pablo, Chihuahua. In the Cactaceae of the Mexican Boundary Report, Engelmann again describes the plant and illustrates it. His illustrations, however, represent two species. We have defined the species in the same way that Dr. Engelmann did, for it will require further field studies along the border of Texas and Mexico to determine its exact limits; a second species may be confused with it.

FIG. 45.—Echinocereus fendleri.

FIG. 46.—Echinocereus lloydii.

The type specimen consists of four flowers only. Wislizenus also collected two herbarium specimens of the stem of some other *Echinocereus* which were probably used by Engelmann in drawing up his original description. These, however, come from a different locality, Parras, and seem to represent a different species.

On account of the delicious strawberry-like flavor of the fruit this plant is known as the strawberry cactus throughout southern Texas, where the fruit is much used for jams. According to Robert Runyon, it is also called the cob cactus about Brownsville, Texas, because of the cob-like shape of its branches.

Illustrations: Cact. Mex. Bound. pl. 48, f. 2 to 4; pl. 49; Dict. Gard. Nicholson 4: 512. f. 8; Suppl. 217. f. 230; West Amer. Sci. 13: 11, as *Cereus enneacanthus;* Bull. Univ. Texas 82: pl. 3, f. 2, as *Cereus longispinus* (?); Cact. Journ. 1: 135; (?)2: 19; Schelle, Handb. Kakteenk. 127. f. 58; Förster, Handb. Cact. ed. 2. 795. f. 103.

Figure 49 is copied from the first illustration above cited.

51. Echinocereus lloydii sp. nov.

Stems in clusters of 6 or more, very stout, 20 to 25 cm. high, 10 cm. in diameter, bright green; ribs 11, about 3 cm. apart, nearly straight; areoles 15 mm. apart, rather large, circular, somewhat woolly when young; spines rather short, about 10 mm. long, wine-colored, paler at base; radial spines

14; centrals 4 to 6, nearly porrect; flowers large, 8 cm. long, reddish purple; areoles on the ovary bearing clusters of reddish spines; stigma-lobes numerous; perianth-segments narrowly obovate, obtuse or obtusish.

Collected near Tuna Springs, Texas, in 1909, by F. E. Lloyd, for whom it is named.

Plate IV, figure 4, shows the top of one of the type plants in flower at the New York Botanical Garden. Figure 46 is from a photograph of one of the type plants taken in Washington.

52. Echinocereus engelmannii (Parry) Rümpler in Förster, Handb. Cact. ed. 2. 805. 1885.

Cereus engelmannii Parry in Engelmann, Amer. Jour. Sci. II. 14: 338. 1852.
Cereus engelmannii variegatus Engelmann and Bigelow, Proc. Amer. Acad. 3: 283. 1856.
Cereus engelmannii chrysocentrus Engelmann and Bigelow, Proc. Amer. Acad. 3: 283. 1856.
Echinocereus engelmannii chrysocentrus Rümpler in Förster, Handb. Cact. ed. 2. 806. 1885.
Echinocereus engelmannii variegatus Rümpler in Förster, Handb. Cact. ed. 2. 806. 1885.

Cespitose, forming large clumps; joints erect or ascending, cylindric, 1 to 3 dm. long, 5 to 6 cm. in diameter; ribs 11 to 14, low, obtuse; areoles large, nearly circular; radial spines about 10, appressed, stiff, about 1 cm. long; central spines 5 or 6, very stout, more or less curved and twisted, terete or somewhat flattened, sometimes 7 cm. long, yellowish to brown, more or less variegated; flowers somewhat variable in size, 5 to 8 cm. long, and even broader when fully expanded, purple; perianth-segments oblong, 3 to 4 cm. long, acuminate; scales on ovary 3 to 5 mm. long, acuminate; areoles felted and bearing stout bristles; fruit ovoid to oblong, spiny, about 3 cm. long; seeds black, nearly globular, or a little oblique, 1.5 mm. in diameter or less, tuberculate.

Type locality: Mountains about San Felipe, southern California.

Distribution: California, Nevada, Utah, Arizona, Sonora, and Lower California.

The three varieties, *albispinus* Cels, *fulvispinus* Cels, and *pfersdorffii* Heyder, mentioned by Schumann (Gesamtb. Kakteen 276. 1898) are simply forms named from color differences in the spines.

Two other varieties have been mentioned but are unimportant: *robustior* Hildmann and *versicolor* (Monatsschr. Kakteenk. 4: 194. 1894).

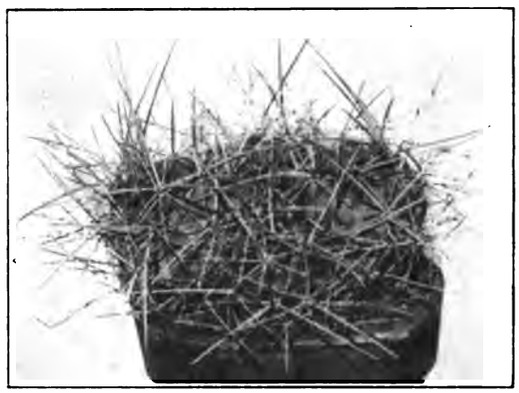


FIG. 47.—Echinocereus sarissophorus.

Some Arizona and Sonora specimens have more slender and lighter-colored spines than is typical, and on these the variety *chrysocentrus* was based. Additional field observations may show this to be a distinct species; the spines closely resemble those of *E. stramineus*.

Illustrations: Journ. N. Y. Bot. Gard. 6: 93, as *Echinocereus;* Cact. Mex. Bound. pl. 57; Gartenflora 33: pl. 1174a, as *Cereus engelmannii;* Pac. R. Rep. 4: pl. 5, f. 8 to 10, as *Cereus engelmannii chrysocentrus;* Pac. R. Rep. 4: pl. 5, f. 4 to 7, as *Cereus engelmannii variegatus;* Cact. Journ. 2: 132, as *Echinocactus engelmannii;* Cact. Journ. 1: pl. for September; 2: 146; Monatsschr. Kakteenk. 16: 151; Schelle, Handb. Kakteenk. 134. f. 65; Journ. N. Y. Bot. Gard. 6: f. 23; Contr. U. S. Nat. Herb. 16: pl. 8, 9.

Plate V, figure 1, shows the top of a plant, which flowered at the New York Botanical Garden, sent by S. B. Parish from southern California in 1915.

53. Echinocereus sarissophorus sp. nov.

Cespitose; stems short, thick, pale green, about 10 cm. thick; ribs 9; radial spines 7 to 10, slender; centrals several, 5 to 8 cm. long, often bluish, somewhat angled; flowers purplish, 7 to 8 cm. long; inner perianth-segments broad; areoles on ovary and flower-tube bearing short, white wool and 3 to 5 long pale bristle-like spines; fruit globular, 2 to 3 cm. in diameter, covered with clusters of deciduous spines; seeds black.

Collected near Saltillo, Coahuila, April 1898, by Dr. E. Palmer (No. 100).

This species is common in Coahuila and Chihuahua, Mexico, having been repeatedly collected by Dr. Palmer and others. It is characterized by its stout, stubby habit and by its very long, usually stiff, often bluish spines.

Figure 47 is from a photograph of a plant collected by Dr. E. Palmer in Mexico in 1908.

54. Echinocereus dubius (Engelmann) Rümpler in Förster, Handb. Cact. ed. 2. 787. 1885.

Cereus dubius Engelmann, Proc. Amer. Acad. 3: 282. 1856.

Somewhat cespitose; stems 12 to 20 cm. long, pale green, of a soft flabby texture, 7 to 9-ribbed; ribs broad; spines white; radial spines 5 to 8, 12 to 30 cm. long; centrals 1 to 4, 3.5 to 7.5 cm. long, angled, often curved; flowers pale purple, 6 cm. long or more, with rather few and narrow perianth-segments; scales on flower-tube bearing 1 to 3 white bristles in their axils; fruit very spiny, 2.5 to 3 cm. long; seeds covered with confluent tubercles.

FIG. 48.—Flower of Echinocereus dubius.

FIG. 49.—Flower of Echinocereus enneacanthus.

Type locality: Sandy bottoms of the Rio Grande at El Paso.

Distribution: Southeastern Texas, perhaps confined to the El Paso region.

This is said by Engelmann to be near *Echinocereus stramineus* and *E. enneacanthus*. The former, however, grows in the mountains and must be quite distinct. It is given a wide range by Schumann, who doubtless has included specimens of one or more related species. We know it only from co-type herbarium specimens of the Mexican Boundary Survey.

Illustrations: Cact. Mex. Bound. pl. 50, as *Cereus dubius;* Ann. Rep. Smiths. Inst. 1908: pl. 9, f. 3.

Figure 48 is copied from a part of the first illustration above cited.

55. Echinocereus* conglomeratus Förster, Gartenflora 39: 465. 1890.

Cereus conglomeratus Berger, Rep. Mo. Bot. Gard. 16: 81. 1905.

Cespitose, forming large clumps; joints simple, often half covered in the ground, 1 to 2 dm. long; ribs 11 to 13, slightly undulate; areoles 1 to 1.5 cm. apart, small, circular, slightly felted; spines white to brownish; radial spines acicular, 1.5 to 2.5 cm. long, spreading; central spines several, elongated, often 7 cm. long, very flexible; flowers 6 to 7 cm. long, broad and open, purplish; perianth-segments broad, 2 cm. long; spines on ovary and flower long, white, more or less curved; fruit globular, 3 cm. in diameter, somewhat acid, edible; seeds numerous.

*The generic name for this species was given in Gartenflora as *Echinocactus* in error.

Type locality: Rinconada, near Monterey, Mexico.

Distribution: Mountains in the states of Nuevo Leon, Coahuila, and Zacatecas, Mexico.

This species has usually been confused with *E. stramineus* but it has smaller, more open flowers, and it has a more southern range.

The plant is called alicoche; the fruit, which is edible, is known as pitahaya.

Illustrations: Blanc, Cacti 56, No. 736; Karsten and Schenck, Vegetationsbilder 2: pl. 19, b; 20, d; 22, a; 24.

Figure 50 is from a photograph of a plant collected by Dr. E. Palmer, near Saltillo, Mexico, and contributed by Dr. William E. Safford.

FIG. 50.—Echinocereus conglomeratus.

56. Echinocereus stramineus (Engelmann) Rümpler in Förster, Handb. Cact. ed. 2. 797. 1885.

Cereus stramineus Engelmann, Proc. Amer. Acad. 3: 282. 1856.

Plants grouped in masses forming immense mounds 1 to 2 meters in diameter and 3 to 10 dm. high; joints 12 to 25 cm. long, 3 to 7 cm. in diameter; ribs about 13, almost hidden by the long spines; spines at first brownish to straw-colored, in age nearly white; radial spines 7 to 14, 2 to 3 cm. long, spreading; central spines 3 or 4, 5 to 9 cm. long; flowers purple, 8 to 12 cm. long; perianth-segments oblong, 3 to 4 cm. long, rounded at apex; spines from the axils of scales on ovary and flower-tube, 2 to 5, short, white; fruit nearly globular, 3 to 4 cm. in diameter, red, spiny at first, becoming glabrous, edible; seeds 1.5 mm. in diameter, somewhat oblique.

Type locality: Mountain slopes, El Paso, Texas.

Distribution: Western Texas, southern New Mexico, and northern Chihuahua.

This species has often been given a much wider range than is here assigned to it, as it has been confused with other related species.

The plant is found only on dry mountains or hills, where it makes very large mounds; one of these observed by Dr. Rose in New Mexico was 15 dm. broad and 9 dm. high at the center, and was estimated to contain 400 to 500 joints.

Echinocereus bolansis Rünge (Monatsschr. Kakteenk. 5: 123. 1895) was never published, but was referred here by Schumann.

The plants figured as *Echinocereus stramineus* in the Cactus Journal (1: 136; 2: 19) do not seem to belong here, but to *E. fendleri.*

Illustrations: Cact. Mex. Bound. pl. 46 to 48, f. 1, as *Cereus stramineus;* Möllers Deutsche Gärt. Zeit. 25: 482. f. 14; (?) Cact. Journ. 1: 136; 2: 19.

Figure 51 is from a photograph of a plant collected by Dr. Rose on the Sierra Blanca, Texas, in 1913; figure 52 shows a flower and figure 53 a fruit copied from the above cited illustrations in the Cactaceae of the Mexican Boundary Survey.

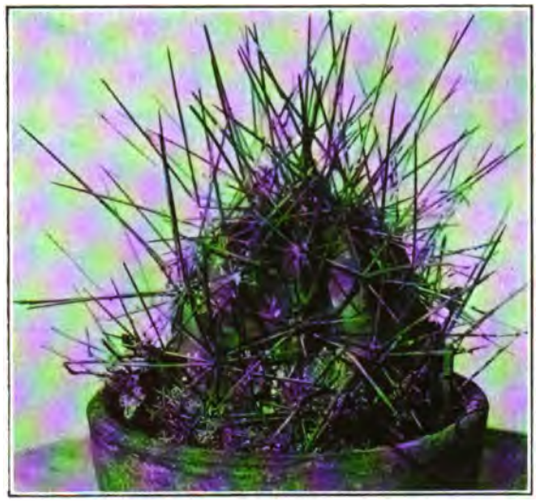


FIG. 51.—Echinocereus stramineus.

57. Echinocereus barthelowanus sp. nov.

Plants cespitose, forming large clusters; stems cylindric, 1 to 2 dm. long, 4 to 5 cm. in diameter; ribs about 10, somewhat tuberculate below, but completely hidden by the stout numerous spines; areoles approximate, 2 to 5 mm. apart, white-felted when young; spines numerous, acicular, sometimes 7 cm. long, pinkish when quite young, afterward white or yellow with brown or blackish tips, in age becoming gray; flowers only 10 to 12 mm. long; perianth-segments oblong, 3 to 4 mm. long, ovary minute, strongly tubercled, hidden under the mass of spines; spine-clusters on ovary with 6 to 12 white or pinkish tipped spines, half as long as the flower.

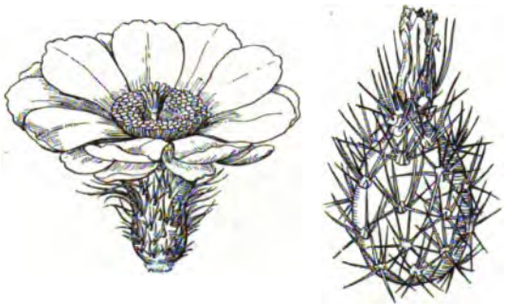
Collected by J. N. Rose on the mesa, near Santa Maria Bay, Lower California, March 18, 1911 (No. 16278). Here we would refer also plants collected by C. R. Orcutt near the same locality in 1917.

The species is named for Captain Benjamin Barthelow, in whose company Dr. Rose collected the plant while making a cruise in the Lower California waters on the U. S. Steamer *Albatross* in 1911.

58. Echinocereus mamillatus (Engelmann).

Cereus mamillatus Engelmann in Coulter, Contr. U. S. Nat. Herb. 3: 405. 1896.

Cespitose; stems ascending, 2 to 3 dm. long, cylindric, 3.5 to 6 cm. in diameter; ribs 20 to 25, sometimes oblique, strongly tuberculate; spines white or pinkish; radial spines 10 to 25, acicular, 3 to 12 mm. long; central spines 3 or 4, much stouter than the radials, 1 to 2.5 cm. long; flowers and fruit unknown.



FIGS. 52 and 53.—Flower and fruit of Echinocereus stramineus. ×0.25.

Type locality: Mountain sides south of Mulege, Lower California.

Distribution: Southern Lower California.

Illustration: Schelle, Handb. Kakteenk. 97. f. 36, as *Cereus mamillatus*.

Figure 54 is from a photograph of a plant sent to the New York Botanical Garden from the Missouri Botanical Garden, in 1904.

59. Echinocereus ehrenbergii (Pfeiffer) Rümpler in Förster, Handb. Cact. ed. 2. 775. 1885.

Cereus ehrenbergii Pfeiffer, Allg. Gartenz. 8: 282. 1840.

Cespitose, 2 dm. high; joints often procumbent, pale or leaf-green; ribs 6, obtuse, sinuate, areoles remote, 2 cm. apart, white-felted; radial spines 8 to 10, slender, white; central spines 3 or 4, yellowish at base; flowers not known.

Type locality: Not cited.

Distribution: Central Mexico.

A living plant was obtained for the New York Botanical Garden from M. Simon of St. Ouen, Paris, in 1901, but it died before flowering.

This species was named for Karl Ehrenberg who spent ten years in Mexico, where he made large collections of cacti.

E. ehrenbergii cristatus (Förster, Handb. Cact. ed. 2. 776. 1885) is a garden monstrosity.

60. Echinocereus longisetus (Engelmann) Rümpler in Förster, Handb. Cact. ed. 2. 822. 1885.

Cereus longisetus Engelmann, Proc. Amer. Acad. 3: 280. 1856.

Plants simple or nearly so, cylindric, 15 to 25 cm. long, 5 to 7.5 cm. in diameter; ribs 11 to 14, somewhat tubercled; areoles circular; spines slender, elongated, white; radial spines 18 to 20, spreading, the lower 10 to 15 mm. long, much longer than the upper; central spines 5 to 7, very unequal, the lower elongated, 2.5 to 5.5 cm. long, deflexed; flowers said to be red.

FIG. 54.—Echinocereus mamillatus.

FIG. 55*a*.—Echinocereus sp.

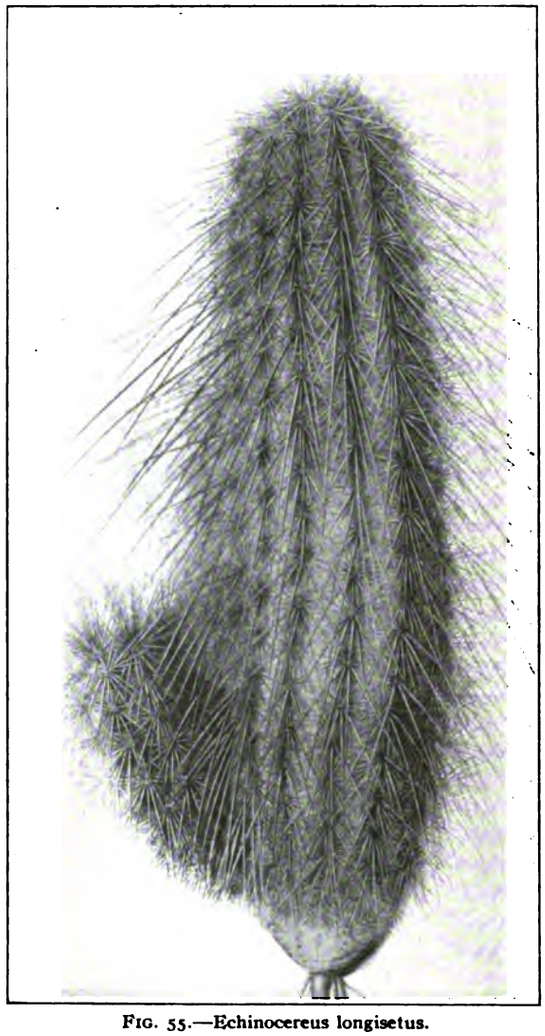


FIG. 55.—Echinocereus longisetus.

Type locality: Santa Rosa, south of the Rio Grande in Coahuila.

Distribution: Coahuila.

This plant, although collected as long ago as 1853 and well illustrated, has not been rediscovered; neither flowers nor fruit were collected and these are still desiderata; when obtained the relationship of this evidently distinct species can be determined.

Illustration: Cact. Mex. Bound. pl. 45, as *Cereus longisetus*.

Figure 55 is a copy of the illustration above cited.

ECHINOCEREUS sp.

A cylindric white-spined plant of this genus is illustrated by a photograph of Professor Lloyd's No. 27, collected by him in the Quijotoa Mountains, Arizona, in August 1906; neither flowers nor fruits were seen.

Figure 55*a* is reproduced from this photograph.

ECHINOCEREUS sp.

In March 1910, in the mountain above Alamos, Sonora, a specimen of this genus was collected by Rose, Standley, and Russell, which we have not been able to identify (No. 13123); living plants have been under observation since, but no flowers have yet been produced. It may be described as follows:

Densely cespitose, usually 1, sometimes 2-jointed, dark green; ribs 7 or 8, low but distinct, the margin nearly straight; areoles approximate, 2 to 3 mm. apart; areoles minute, circular, white-felted; spines acicular, at first yellowish, often with brownish tips but soon whitish, less than 1 cm. long; radial spines about 10; central spines 3 or 4; flowers and fruit unknown.

It resembles *E. scheeri* but has slenderer joints and more delicate spines, and is of more western range.

ECHINOCEREUS PLEIOGONUS (Labouret) Croucher, Garden **13**: 290. 1878.

Cereus pleiogonus Labouret, Monogr. Cact. 317. 1853.

Short-cylindric, 5 to 13 cm. high; ribs 9 or 10; spines stiff, yellow, reflexed, 8 to 12, about 1 cm. long; flowers pinkish red, as long or longer than the plant itself; inner perianth-segments serrate.

It was introduced into France by M. Cels but its native country is not known. The illustrations cited below seem to represent some species of *Echinocereus* but we are not able to identify them. For further remarks on this species see *Echinocereus leeanus*, p. 9.

Illustrations: Dict. Gard. Nicholson 1: 299. f. 409; Watson, Cact. Cult. 82. f. 26, as *Cereus pleiogonus;* Garden **13**: 291.

UNCERTAIN OR UNDESCRIBED SPECIES.

The following names have not been published or the plants have been so briefly or poorly described that they have not been identified:

CEREUS MACRACANTHUS Linke (Allg. Gartenz. **25**: 239. 1857) is said to be related to *Cereus eburneus*, but Schumann thinks it is an *Echinocereus*.

ECHINOCEREUS BARCENA Rebut (Monatsschr. Kakteenk. **6**: 127. 1896) is a garden name, but has never been described.

ECHINOCEREUS BICOLOR Galeotti (Wiener Illustr. Gartenz. 83. 1893, *fide* Index Kewensis Suppl. 1: 149) is not found at the place or in the work cited above. The name intended was probably *Echinocactus bicolor* Galeotti.

ECHINOCEREUS BOLIVIENSIS Poselger (Schumann, Gesamtb. Kakteen 290. 1898) does not belong to this genus.

ECHINOCEREUS CLAVIFORMIS (Haage, Preis-Verz. Cact. 22. *fide* Index Kewensis) is, so far as we know, unpublished. It is doubtless based on *Cereus* (*Echinocereus*) *claviformis* Regel and Klein (Ind. Sem. Hort. Petrop. 46. 1860).

ECHINOCEREUS GALTIERI (Monatsschr. Kakteenk. **5**: 124. 1895) is only a garden name.

ECHINOCEREUS GRAHAMII (Monatsschr. Kakteenk. **20**: 47. 1910) is doubtless intended for *Mammillaria grahamii.*

ECHINOCEREUS HAVERMANSII Rebut (Schumann, Gesamtb. Kakteen 290. 1898 and Monatsschr. Kakteenk. **17**: 64. 1907) is only a name.

ECHINOCEREUS MALIBRANII Rebut seems to be only a catalogue name.

ECHINOCEREUS MAMILLOSUS (Rümpler in Förster, Handb. Cact. ed. 2. 787. 1885), undescribed, is supposed to be a hybrid.

ECHINOCEREUS SCHLINI, is a horticultural name, but supposed to be a misspelling of *E. scheeri.*

ECHINOCEREUS THURBERI (Monatsschr. Kakteenk. **3**: 153. 1893) may have been intended for *Cereus thurberi.*

ECHINOCEREUS THWAITESII (Schumann, Gesamtb. Kakteen 290. 1898) is only a name.
ECHINOCEREUS TROCKYI is advertised for sale by A. V. Frič at 20 to 40 marks per plant (Monatsschr. Kakteenk. **28**: No. 8. 1918).

The following have been listed in the American Cyclopedia of Horticulture as being unidentifiable: *Echinocereus polycephalus*, *E. paucupina*, *E. uspenskii*, *E. uehri*, and *E. sanguineus*.

Echinocereus dahliaeflorus, with an illustration, appeared in a reputable Garden Magazine (Möllers Deutsche Gärt. Zeit. 15: 148. 1900), issued on April 1st. The April Fool joke is so cleverly concealed that the editor deceived himself, for he carefully indexed the name at the end of the year. The name is to be ignored.

Echinocereus princeps Förster, *E. persolutus* Förster (Hamb. Gartenz. 17: 163. 1861), and *E. raphicephalus* Förster (Hamb. Gartenz. 17: 164. 1861) were described without flowers and we can not decide their generic alliance. The second species came from Peru and can be excluded from this genus.

Echinocereus penicilliformis Linke (Wochenschr. Gärtn. Pflanz. 1: 85. 1858) we do not know, but since it comes from Bolivia it can be excluded from the genus *Echinocereus*.

2. AUSTROCACTUS gen. nov.

Plants low, ribbed, the areoles borne on the tuberculate ribs; spines in two series, the centrals hooked; flowers diurnal(?), borne at the upper part of areoles near the top of the plant, large, pinkish yellow, with a short, but rather definite tube and campanulate limb; perianth-segments aristate-acuminate; style as long as the stamens; stigma-lobes red to purplish; ovary and flower-tube very spiny or bristly; fruit spiny; seeds dull, flattened, reticulated.

Type species: *Cereus bertinii* Cels.

Only one species is known, inhabiting Patagonia.

The generic name is from *auster*, south, and cactus, referring to the habitat of the plant.

This genus seems to be the South American representative of the North American genus *Echinocereus*. It is like it in habit, ribs, flowers, and fruit, but its stigma-lobes are red, not green, and the central spines are always hooked. It has nothing to do with *Eulychnia* to which Berger referred it.

FIG. 56.—Austrocactus bertinii.

1. Austrocactus bertinii* (Cels).

Cereus bertini Cels, Hort. Franc. II. 5: 251. 1863.

Simple or perhaps sometimes cespitose, olive-green, 15 to 40 cm. high; ribs 10 to 12, prominent; areoles circular, yellow-felted; radial spines about 15, acicular, straight, spreading, about 1 cm. long; central spines 4, very slender, strongly hooked, brownish to blackish, the lower and longest up to 3 cm. long; flowers when fully expanded reaching 10 cm. in breadth, about 6 cm. long; outer perianth-segments about 30, pinkish to brown, spiny tipped; inner perianth-segments about 20, pinkish yellow, oblong, long-acuminate, 4 cm. long, 1 cm. broad; stamens in two definite series; style thickish, red, longer than the stamens; stigma-lobes 16, linear; ovary and flower-tube with numerous areoles, these with clusters of 5 or 6 bristles or acicular spines.

Type locality: On the coast of Argentina, latitude 45° 30′ South.
Distribution: Southern Argentina† (Patagonia).

*The original spelling of the specific name was *bertini*.
†Schumann states that it comes from Paraguay while the Index Kewensis says Chile.

This species was discovered in 1855 by E. Cels, a brother of F. Cels, at one time a cactus dealer, who first described the plant; it was again collected at the type locality by Captain Bertin in 1861, for whom it was named. The first plants obtained did not live, but those of the second collection lived and flowered. Since then no plants have been reported, although the region in which it grows must have been frequently visited by collectors. Dr. Spegazzini, who knows Argentina well, was surprised to learn that such a plant was reported from southern Argentina. The illustration of *Cereus bertinii* certainly seems to represent a quite distinct genus. Our attention was first called to this species by the discovery of the illustration, cited below, by Dr. Rose, in an old book stall on the banks of the Seine in Paris in 1912.

Although described as *Cereus*, Cels calls attention to its relationship to *Echinocereus* and states that it should form a separate group. It has been cited as *E. bertinii* by Schelle (Handb. Kakteenk. 96. 1907).

Schumann (Gesamtb. Kakteen 163. 1897) established a series in *Cereus* called *Ancistracanthi* for this species, which he seems to have abandoned as a series name, and the species itself is omitted from his Keys published in 1903.

Illustration: Hort. Franc. II. 7: pl. 14, as *Cereus bertinii*.

Figure 56 is copied from the illustration above cited.

3. REBUTIA Schumann, Monatsschr. Kakteenk. 5: 102. 1895.

Plants small, globose to short-cylindric, single or cespitose, tuberculate, not ribbed, resembling a small *Coryphantha;* flower diurnal, arising from old tubercles, at the base or side of the plant, small, red or orange, with a slender, somewhat curved funnelform tube and a spreading or campanulate limb; scales on ovary small, naked or hairy in their axils, withering and persistent on the fruit; fruit small, red, not spiny.

Type species: *Rebutia minuscula* Schumann.

Five species, all South American, are here described. These have been referred heretofore either to *Echinocactus* or *Echinopsis*, or to both. They differ from *Echinocactus* in their lateral flowers borne at old areoles as well as in the structure of flowers, fruit, and plant-body. They are like *Echinopsis* in having lateral flowers, but otherwise very unlike any of the species of that genus. The plant-body in shape, size, and tubercles suggests some species of *Coryphantha*.

We know so little of the plants that we are not able to describe them very accurately and have depended largely upon descriptions and illustrations.

The genus was named by Schumann for P. Rebut, a cactus dealer.

KEY TO SPECIES.

Axils of scales on ovary and fruit naked..... 1. *R. minuscula*
Axils of scales on ovary and fruit hairy.
  Flowers from side of plant, near the middle..... 2. *R. fiebrigii*
  Flowers from the lower part of the plant.
    Central spines 1 to 4..... 3. *R. pseudominuscula*
    Central spines none.
      Areoles elliptic; spines spreading, swollen at base..... 4. *R. pygmaea*
      Areoles circular; spines not widely spreading, not swollen at base..... 5. *R. steinmannii*

1. Rebutia minuscula Schumann, Monatsschr. Kakteenk. 5: 102. 1895.

Echinopsis minuscula Weber, Dict. Hort. Bois 471. 1896.
*Echinocactus minusculus** Weber in Schumann, Gesamtb. Kakteen 395. 1898.

Plants simple or tufted, globular, 2 to 5 cm. in diameter, covered with low tubercles arranged in 16 to 20 spirals, bright green; spines in clusters of 25 to 30, 2 to 3 mm. long, whitish; flowers often numerous, arising from the spine-areoles near the base of the plant, slightly bent just above the ovary, funnelform, 2.5 to 3 cm. long, bright crimson; scales on the small ovary ovate, acuminate, with naked axils; perianth-segments about 12, about 1 cm. long, linear-oblong, acute; stamens 15 to 30, whitish; stigma-lobes 4 or 5, whitish; fruit 3 mm. in diameter, scarlet.

*Weber (Dict. Hort. Bois 471. 1896) mentions it as a synonym, but does not describe it. It was introduced into cultivation in 1887 and has since been a favorite.

Type locality: Tucuman, Argentina.

Distribution: Northwestern Argentina.

This little plant has flowered frequently both in Washington and New York, often as early as March; the flowers open in the morning and close at night, opening for four days consecutively and then followed in a few days by the small scarlet fruits.

FIG. 57.—Rebutia minuscula.

FIG. 58.—Rebutia pseudominuscula.

This plant is so small that when grown alone it is quite inconspicuous, but de Laet has grown it very successfully as a graft on one of the cylindric cacti. When grown this way it gives off many new plants, forming a cespitose mass and flowering freely. De Laet also lists in his Catalogue the variety *cristatus* under *Echinocactus minusculus*.

Illustrations: Blühende Kakteen 1: pl. 31; Schumann, Gesamtb. Kakteen f. 67; Curtis's Bot. Mag. 140: pl. 8583; Monatsschr. Kakteenk. 26: 152, 153; 29: 141; Tribune Hort. 4: pl. 140; Kirtcht, Kakteen Zimmergarten 9; De Laet, Cat. Gen. 3. f. 2, as *Echinocactus minusculus;* Monatsschr. Kakteenk. 5: 103.

Plate IV, figure 5, shows a flowering plant sent to the New York Botanical Garden from the Missouri Botanical Garden in 1912. Figure 57 is from a photograph contributed by Dr. Spegazzini.

2. Rebutia fiebrigii (Gürke) Britton and Rose, Stand. Cycl. Hort. Bailey 5: 2915. 1916.

Echinocactus fiebrigii Gürke, Notizbl. Bot. Gart. Berlin 4: 183. 1905.

Globose, depressed at apex, 5 cm. high, tuberculate; areoles elliptic; spines 30 to 40, setaceous, 1 cm. long, white, or the longest ones brownish at apex and 2 cm. long or more, porrect, acicular; flowers from the side of the plant, 2 cm. long, slender, funnelform, red, bent upwards; scales on the ovary small, woolly, and bristly; fruit small, purple; inner perianth-segments oblong, acute.

Type locality: Bolivia, at Escayacje, altitude 3,600 meters.

Distribution: Known only from the type locality.

This is a very attractive little plant which Dr. Rose saw in the Berlin Botanical Garden in 1912. A specimen was sent from the Berlin Botanical Garden to the New York Botanical Garden which we have also studied. The plant is named for Dr. C. Fiebrig, director of the Museum and Garden at Asuncion, Paraguay.

FIG. 59.—Rebutia fiebrigii.

Illustrations: Blühende Kakteen 2: pl. 109; Monatsschr. Kakteenk. 28: 139, as *Echinocactus fiebrigii.*

Figure 59 is copied from the first illustration above cited.

3. Rebutia pseudominuscula (Spegazzini).

Echinopsis pseudominuscula Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 488. 1905.

Simple or somewhat cespitose, globular to short-cylindric, 5 cm. high, 3.5 cm. in diameter, strongly tubercled; the tubercles about 5 mm. high; areoles elliptic, gray-felted; radial spines 7 to 14, setaceous, 3 to 5 mm. long, at first yellowish or rose-colored; central spines 1 to 4; flowers from the lower half of the plant, red, 2.5 cm. long, with a slender funnelform tube; scales on ovary and flower-tube few, the axils hairy; perianth-segments oblanceolate to spatulate, 15 to 18 mm. long, obtuse, sometimes mucronate; stigma-lobes 6, white.

Type locality: Mountains, 3,500 meters altitude, province of Salta, Argentina.

Distribution: Known only from the type locality.

Echinocactus pseudominusculus Spegazzini (Anal. Mus. Nac. Buenos Aires III. 4: 488. 1905) was given as a synonym of this species when first described.

Figure 58 is from a photograph contributed by Dr. Spegazzini.

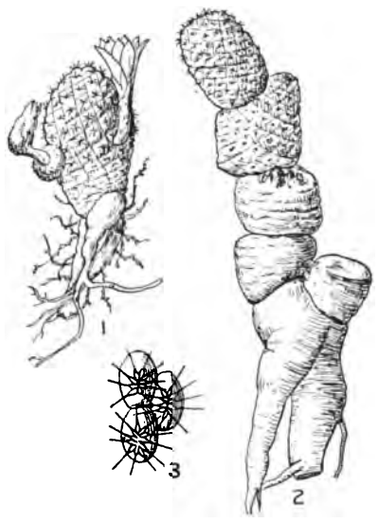


FIG. 60.—Rebutia pygmaea.

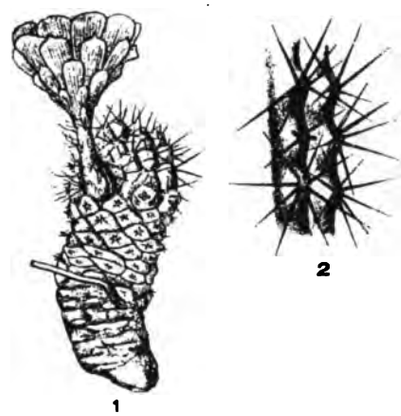


FIG. 60 a.—Plant and section of stem of Rebutia steinmannii.

4. Rebutia pygmaea (R. E. Fries).

Echinopsis pygmaea R. E. Fries, Nov. Act. Soc. Sci. Upsal. IV. 1[1]: 120. 1905.

Simple, ovoid to short-cylindric, 1 to 3 cm. long, 1.2 to 2 cm. in diameter, or sometimes branched with 2 to many short joints from a much thickened root; tubercles small, more or less arranged into 8 to 12 spiraled rows; areoles narrow, somewhat lanate; spines all radial, 9 to 11, short, appressed, 2 to 3 mm. long, acicular, somewhat swollen at base; flowers from the lower part of the plant, somewhat curved at base, becoming nearly erect, 18 to 25 mm. long, rose-purple; scales on ovary and flower-tube small, hairy in their axils; fruit globular, 6 mm. in diameter.

Type locality: Yavi, province of Jujuy, Argentina.

Distribution: Bolivia and northwestern Argentina.

We have studied living plants collected by Dr. Rose at Oruro, Bolivia.

Illustrations: Nov. Act. Soc. Sci. Upsal. IV. 1[1]: pl. 8, f. 1 to 3, as *Echinopsis pygmaea.*

Figure 60 is copied from the illustration above cited.

5. Rebutia steinmannii (Solms-Laubach).

Echinocactus steinmannii Solms-Laubach, Bot. Zeit. 65[1]: 133. 1907.

Small oblong plants (about 2 cm. high) 1 to 1.5 cm. in diameter; ribs low, often spiraled, tubercled; spines acicular, about 8; flowers from the side of the plant, erect, campanulate; outer perianth-segments oblong, apiculate; inner perianth-segments rounded.

Type locality: High mountains of Bolivia.

Distribution: Known only from the type locality.

This very strange plant is unknown to us except from the description and illustrations, but it seems to be of this relationship.

Illustrations: Bot. Zeit. 65[1]: pl. 2, f. 4, 10, as *Echinocactus steinmannii.*

Figure 60*a* is from a photograph of the illustrations cited above.

DESCRIBED SPECIES, PERHAPS OF THIS GENUS.

ECHINOPSIS DEMINUTA Weber, Bull. Mus. Hist. Nat. Paris 10: 386. 1904.

Echinocactus deminutus Gürke, Monatsschr. Kakteenk. 16: 103. 1906.

Plants globular to short-cylindric, 5 to 6 cm. high; ribs 11 to 13, somewhat spiraled, more or less tuberculate; spines numerous, somewhat rigid; flowers 3 cm. long, with a limb 3 cm. broad; outer perianth-segments lanceolate, purple, 4 to 5 mm. long; inner perianth-segments 15, red to orange, 5 to 6 mm. long; ovary bristly, 6 mm. in diameter; stigma-lobes white.

Type locality: Trancas, Argentina.

Distribution: Known only from the type locality.

We append the description of this plant to our genus *Rebutia*, to which it may belong, but we have not been able to study any specimens of it. Weber's reference of the species to *Echinopsis* certainly is erroneous, nor is it an *Echinocactus* in our understanding of that genus.

4. CHAMAECEREUS gen. nov.

Plants small, usually creeping and forming little clumps, sometimes some of the joints pendent, usually arising from the base, cylindric, with a few low ribs; spines acicular; flowers diurnal, solitary at the areoles, comparatively small, erect; tube cylindric, bearing acute scales with hairy axils; inner perianth-segments spreading, scarlet; stamens included; fruit small, globular, dry or nearly so, bearing long woolly hairs; seeds black, opaque, punctate.

Type species: *Cereus silvestrii* Spegazzini.

Only one species is known, inhabiting Argentina.

We are indebted to Mr. Alwin Berger for notes upon this interesting plant which have been freely used in our description.

The first part of the generic name is from χαμαί on the ground, referring to the creeping or depressed habit of the plant.

FIG. 61.—Chamaecereus silvestrii.

1. Chamaecereus silvestrii (Spegazzini).

Cereus silvestrii Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 483. 1905.

Joints usually prostrate, sometimes 4 to 6 cm. high, pale green; ribs about 6 to 9, but usually 8, low; spines soft, white; flowers orange-scarlet, about 7 cm. long, the axils of the scales bearing long black and white hairs and a few bristles; flower-tube narrow, 2.5 to 3 cm. long; perianth-segments in 3 or 4 series, spreading, 1 to 2 cm. long, 4 mm. broad, lanceolate, the outer ones acute, the inner shorter and obtuse; filaments red to purple, short; style pale yellow to greenish white, longer than the stamens; stigma-lobes 8 or 9, connivent.

Type locality: Mountains between Tucuman and Salta, Argentina.

Distribution: Tucuman, Argentina.

This plant resembles in habit some of the creeping species of *Echinocereus*, but has very different flowers; it has no close relatives in Argentina; it is largely grown in European collections, where it is highly prized. Dr. Rose obtained specimens in Argentina in 1915, but so far none has flowered.

This species was named for Dr. Philip Silvestri, a friend of Dr. Spegazzini.

Illustrations: Curtis's Bot. Mag. 138: pl. 8426; Gartenwelt 15: 484; Haage and Schmidt, Haupt-Verz. 1919: 167, as *Cereus silvestrii*.

Figure 61 is from a photograph contributed by Dr. Spegazzini in 1915.

5. LOBIVIA gen. nov.

Plant globular to short-cylindric, either simple or in clusters, always ribbed, usually very spiny; flowers so far as known diurnal, short-funnelform to campanulate, lateral from old areoles, in some from near the top, in others well down on the side of the plant, with a short, broad tube, red in typical species, but in others yellow or white; scales on the ovary mostly bearing long hairs in their axils; fruit small, globular.

Type species: *Echinocactus pentlandii* Hooker.

The genus as here treated is composed of 20 species, mostly hitherto referred to *Echinopsis* and *Echinocactus*. It is made to include various anomalous species which can not properly be referred to any described genus, and it is questionable whether they are all congeneric. Some, however, we know only from descriptions or photographs and further knowledge of them may lead to a different arrangement. In form their flowers are much alike. The two species transferred from *Echinocactus* (*E. thionanthus* and *E. chionanthus*) are described as having a dense ring of hairs on the inside of the flower-tube below the stamens; this with other differences in the shape of the flower may be of generic value. The species all inhabit the highlands of Peru, Bolivia, and Argentina.

The generic name is an anagram of Bolivia.

KEY TO SPECIES.

A. Base of flower-tube naked within.
  B. Ribs 20 to 50 or more.
    Plant somewhat depressed; spines not long ..... 1. *L. bruchii*
    Plant globose to cylindric; spines very long.
      Tubercles very large, 2 to 3 cm. long, 1 to 1.5 cm. high; central spines upwardly curved ..... 2. *L. ferox*
      Tubercles 1 to 2 cm. long or less, not over 1 cm. high; spines slender, nearly straight.
        Tubercles narrow, acute; spines subulate ..... 3. *L. longispina*
        Tubercles broad, blunt; spines acicular ..... 4. *L. boliviensis*
  BB. Ribs up to 19, but usually fewer.
    Flowers yellow ..... 5. *L. shaferi*
    Flowers reddish.
      Scales on flower-tube few.
        Spines curved or somewhat hooked.
          Central spines 4, some hooked; radial spines weak, 4 to 5 mm. long, yellowish. 6. *L. cachensis*
          Central spine solitary, never hooked; radial spines 1 to 2 cm. long, brownish. 7. *L. caespitosa*
        Spines straight ..... 8. *L. saltensis*
      Scales on flower-tube numerous.
        Ribs strongly undulate or broken into narrow tubercles.
          Inner perianth-segments broad.
            Flower-areoles short-hairy; tubercles long, acute.
              Spines grayish, short ..... 9. *L. cinnabarina*
              Spines yellowish brown, elongated ..... 10. *L. pentlandii*
            Flower-areoles long-hairy; tubercles short, blunt ..... 11. *L. lateritia*
          Inner perianth-segments narrow.
            Flowers 5.5 to 6 cm. long, white-hairy ..... 12. *L. pampana*
            Flowers small, 3 cm. long, black-hairy ..... 13. *L. corbula*
        Ribs not strongly undulate, at least never tubercled.
          Flowers 6 cm. long or less.
            Central spine 1 to 2.5 cm. long ..... 14. *L. andalgalensis*
            Central spines up to 5 cm. long ..... 15. *L. haematantha*
          Flowers 10 cm. long ..... 16. *L. grandiflora*
  AA. Base of flower-tube with ring of hairs on inside; scales on outside of flower reflexed at apex.
    Flowers yellow ..... 17. *L. thionanthus*
    Flowers white ..... 18. *L. chionanthus*
  AAA. Species not grouped ..... 19. *L. grandis*, 20. *L. cumingii*

1. Lobivia bruchii sp. nov.

Plants simple, globular, more or less depressed in the center; ribs 50 or more, distinct but low, more or less tuberculate; areoles filled with short white wool; spines several, spreading, usually dark colored, those of the upper areoles connivent; flowers small, at areoles below the apex of plant, deep red; tube of flower short, its axils filled with wool; inner perianth-segments lanceolate, slightly spreading; filaments exserted beyond the throat, but shorter than the perianth-segments; fruit and seeds unknown.

Described from a photograph taken in March 1907, sent by Dr. C. Bruch, of a plant in Tafi del Valle, province of Tucuman, Argentina.

Figure 62 is from the photograph mentioned above.

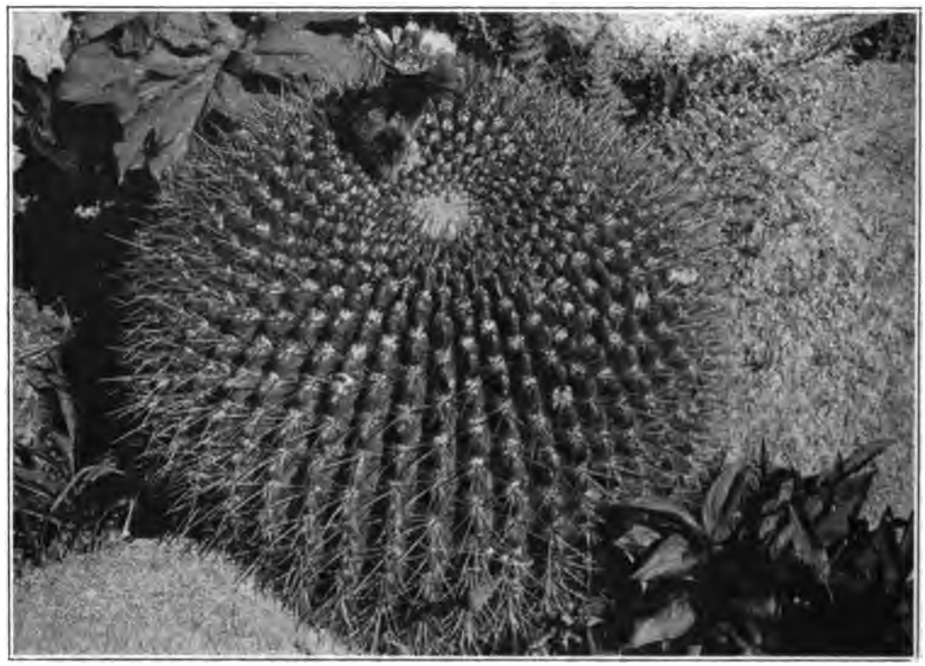


FIG. 62.—Lobivia bruchii.

2. Lobivia ferox sp. nov.

Roots fibrous; plants globular, 3 dm. in diameter or more, almost hidden by the long upwardly curved spines; ribs numerous, often as many as 29, deeply undulate and broken into thin, acute tubercles 2 to 3 cm. long; spines light brown, sometimes mottled; radial spines 10 to 12, slender, 4 to 6 cm. long, somewhat curved; central spines 3 or 4, somewhat flattened in one vertical row, rather weak, curved upward, 10 to 15 cm. long; flower-buds woolly; flowers and fruit not seen.

Collected on dry hills east of Oruro, Bolivia, August 18, 1914, by J. N. Rose (No. 18918).

In cultivation, as is shown by our illustration, the long upturned spines are very poorly developed at the top of the plant which is nearly naked. This plant was observed in only one locality in Bolivia, although it is doubtless to be found elsewhere; it grows on very dry gravelly hills among low thorn bushes. It is easily detached from the soil having only fibrous roots and in this respect is very unlike another species of this genus (see No. 18919) which has fleshy deep-seated roots. In its long stout upturned spines it is unlike any other plant we know and has a very striking habit. Several living plants were sent to the New York Botanical Garden in 1914 by Dr. Rose, one of which

still persists, but it has never flowered. We are disposed to refer here an illustration (Illustr. Hort. 6: pl. 214) which was called *Echinopsis pentlandii*.

Figure 63 is from a photograph of a plant brought by Dr. Rose from the type locality in 1914.

FIG. 63.—Lobivia ferox.

3. **Lobivia longispina** sp. nov.

Globose to cylindric, 10 cm. in diameter, up to 25 cm. high, bluish green; ribs 25 to 50, rather low, deeply undulate, broken into acute tubercles 1 to 2 cm. long; spines 10 to 15, slender, elongated, nearly straight, the longest 7 to 8 cm. long, yellowish to brown; flowers funnelform, about 4 cm. long, slender, very hairy, the hairs long and white; limb short; fruit broadly obovoid, about 2 cm. thick, its scales distant, ovate, acuminate, 3 to 4 mm. long.

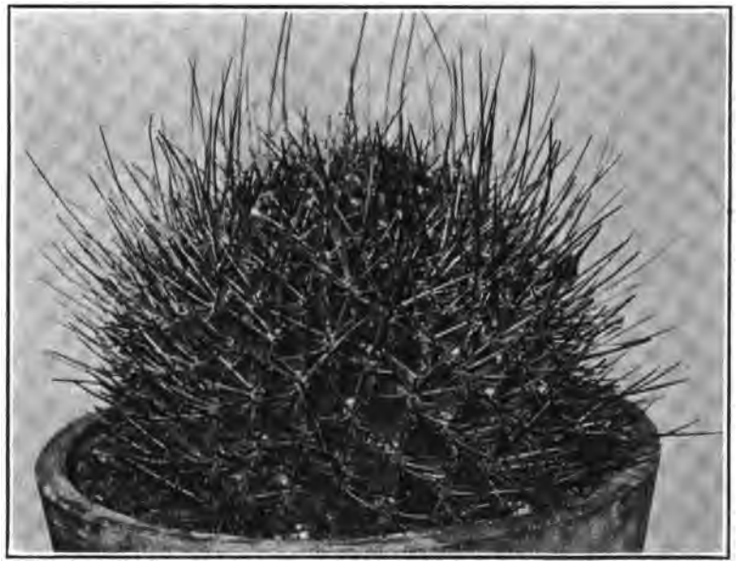


FIG. 64.—Lobivia longispina.

Collected by J. A. Shafer in crevices of rocks at La Quiaca, Jujuy, Argentina, altitude 3,450 meters, February 3, 1917 (No. 83).

We have studied living plants brought by Dr. Shafer to the New York Botanical Garden.

Figure 64 is from a photograph of the type specimen; figure 65 shows the fruit.

4. Lobivia boliviensis sp. nov.

Cespitose, in clusters of about 6; plants globular, 8 to 10 cm. in diameter, almost hidden by the long, nearly straight spines; ribs about 20, undulate, broken into short, blunt tubercles; areoles 1 cm. apart; spines 6 to 8, brown, acicular, flexible, often 9 cm. long.

Collected by Dr. Rose at Oruro, Bolivia, in 1914 (No. 18919).

This plant was quite common on the low dry hills east of Oruro, associated with *Lobivia ferox*, but readily distingushed from it in its very slender spines and in its root system. This species has thick fleshy roots while the other has fibrous roots. It does not do well in cultivation.

Figure 67 is from a photograph of a plant brought by Dr. Rose from the type locality in 1914.

FIG. 65.—Fruit of Lobivia longispina. ×0.6.

FIG. 66.—Flower of Lobivia shaferi. ×0.6.

5. Lobivia shaferi sp. nov.

Cespitose, at first globose, becoming cylindric, 7 to 15 cm. high, 2.5 to 4 cm. in diameter, densely covered with spines; ribs about 10, very low; areoles approximate; radial spines 10 to 15, acicular, white or brown, 1 cm. long or less; central spines several, one often much stouter than the others, 3 cm. long; buds very hairy; flowers 4 to 6 cm. long, funnelform, bright yellow, the tube stout, the limb 3 to 4 cm. broad; scales on ovary and flower-tube linear to ovate-linear, acute, their axils bearing long white hairs; style greenish white; stigma-lobes cream-colored.

Collected by J. A. Shafer in hillside thickets, Andalgala, province of Catamarca, Argentina, December 19, 1916 (No. 16).

Dr. Shafer says that this plant grows in firm leaf-mold underneath and entangled in shrubbery.

Figure 69 is from a photograph taken by Dr. Shafer at Andalgala; figure 66 shows a flower.

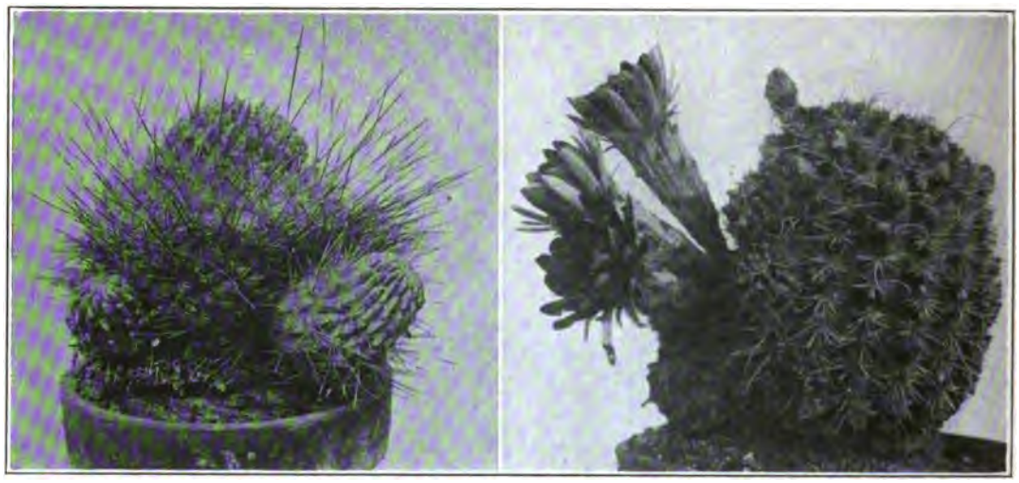


FIG. 67.—Lobivia boliviensis.

FIG. 68.—Lobivia cachensis.

6. Lobivia cachensis (Spegazzini).

Echinopsis cachensis Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 493. 1905.

Stems simple or tufted, 9 cm. high, 6.5 cm. in diameter; ribs about 19, about 5 mm. high; spines soft, hardly pungent, grayish, with yellowish tips; radial spines 7 to 20, straight, 4 to 5 mm. long;

central spines 4, 1 or 2 of them longer and hooked; flowers inodorous, 6 to 7 cm. long; inner perianth-segments linear-lanceolate, red; filaments dark purple; style yellowish; stigma-lobes 10, yellowish white, linear.

Type locality: Near Cachi, Argentina.

Distribution: In the high mountains of Salta, Argentina, altitude 2,500 meters.

We know the plant only from a photograph and the original description.

Spegazzini also gives the name *Echinocactus cachensis* (Anal. Mus. Nac. Buenos Aires III. 4: 493. 1905), but does not formally publish it.

Figure 68 is from a photograph contributed by Dr. Spegazzini.

7. Lobivia caespitosa (J. A. Purpus).

Echinopsis caespitosa J. A. Purpus, Monatsschr. Kakteenk. 27: 120. 1917.

Cespitose, the joints erect or spreading, short, cylindric; ribs 10 to 12, somewhat undulate, acutish; areoles 1 to 1.5 cm. apart, white-woolly; radial spines acicular, 12, brownish, 1 to 2 cm. long; central spine solitary, brown, somewhat curved, 5 cm. long or less; flowers from the side of the plant near the middle, short-funnelform, 6.5 to 8 cm. long, reddish within, yellowish red without; perianth-segments oblong, obtuse.

Type locality: Bolivia.

Distribution: Bolivia.

We know this plant only from description and illustration. It is clearly not an *Echinopsis*.

Illustration: Monatsschr. Kakteenk. 27: 121, as *Echinopsis caespitosa*.

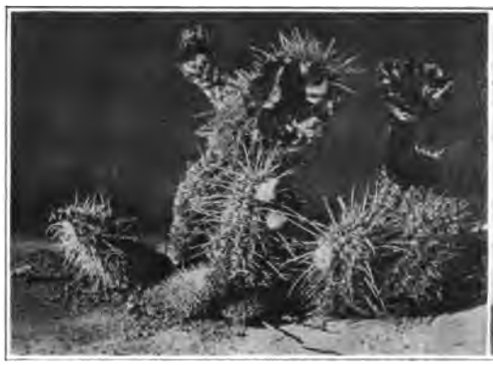


FIG. 69.—Lobivia shaferi.

FIG. 70.—Lobivia saltensis.

8. Lobivia saltensis (Spegazzini).

Echinopsis saltensis Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 487. 1905.

Plants at first simple but becoming densely cespitose, light green, shining; ribs 17 or 18, low, obtuse, crenate; spines all short and straight; radial spines 12 to 14, 4 to 6 mm. long; central spines 1 to 4, stouter than the radials, 10 to 12 mm. long; flowers on the side of the plant near the middle, inodorous, 4 cm. long; perianth-segments red, short, obovate, 10 to 12 mm. long, obtuse; scales on ovary naked in their axils (according to Spegazzini).

Type locality: Near Amblaio, Argentina.

Distribution: Between Tucuman and Salta, Argentina.

Spegazzini also gives the name *Echinocactus saltensis* (Anal. Mus. Nac. Buenos Aires III. 4: 487. 1905), but does not formally publish it.

We know the plant only from a photograph and from the description; the character of the ovary-scales being without hairs in their axils is unusual in the genus. It is described as being only 6.5 cm. high.

Figure 70 is from a photograph contributed by Dr. Spegazzini.

9. Lobivia cinnabarina (Hooker).

Echinocactus cinnabarinus Hooker in Curtis's Bot. Mag. 73: pl. 4326. 1847.
Echinocactus cinnabarinus spinosior Salm-Dyck, Cact. Hort. Dyck. 1849. 35, 176. 1850.
Echinopsis cinnabarina Labouret, Monogr. Cact. 288. 1853.
Echinopsis chereauniana Schlumberger, Rev. Hort. IV. 5: 402. 1856.
Echinopsis cinnabarina spinosior Rümpler in Förster, Handb. Cact. ed. 2. 618. 1885.
Echinocereus cinnabarinus Schumann in Engler and Prantl, Pflanzenfam. 3[6a]: 185. 1894.

Stems simple, broader than high, usually depressed and unarmed at apex, bright green; ribs about 20, irregular and oblique, divided into acute tubercles; radial spines 8 to 10, all more or less curved backward, slender, grayish; central spines 2 or 3, somewhat curved; flowers from near top of the plant, rotate-campanulate, scarlet, about 4 cm. broad; inner perianth-segments broad, obtuse, spreading, the outer ones greenish; stamens and style much shorter than the perianth-segments; scales on ovary and flower-tube lanceolate, acute, hairy in their axils.

Type locality: Bolivia.

Distribution: In the higher Andes of Bolivia.

This species was collected first by Bridges in 1846 and sent to the Royal Gardens, Kew, where it flowered and was illustrated in Curtis's Botanical Magazine; the flowers are described as opening in the morning and closing the second day after.

Echinopsis cinnabarina cheroniana (Monatsschr. Kakteenk. 14: 168. 1904) and var. *cristata* (Monatsschr. Kakteenk. 17: 74. 1907) are mere garden names. Here Weber refers *Echinocactus chereaunianus* Cels (Dict. Hort. Bois 471. 1896) as does also Schumann.

Illustrations: Blühende Kakteen 1: pl. 2; Schumann, Gesamtb. Kakteen f. 44; Möllers Deutsche Gärt. Zeit. 25: 475. f. 7, No. 13, as *Echinopsis cinnabarina;* Curtis's Bot. Mag. 73: pl. 4326; Loudon, Encycl. Pl. ed. 3. 1377. f. 19373, as *Echinocactus cinnabarinus.*

Plate IV, figure 2, shows a plant obtained in 1901 for the New York Botanical Garden from M. Simon, St. Ouen, Paris, which flowered in June 1912.

10. Lobivia pentlandii (Hooker).

Echinocactus pentlandii Hooker in Curtis's Bot. Mag. 70: pl. 4124. 1844.
Echinopsis pentlandii Salm-Dyck in Dietrich, Allg. Gartenz. 14: 250. 1846.
Echinopsis maximiliana Heyder in Dietrich, Allg. Gartenz. 14: 250. 1846.
Echinopsis tricolor Dietrich, Allg. Gartenz. 16: 210. 1848.
Echinopsis pentlandii coccinea Salm-Dyck, Cact. Hort. Dyck. 1849. 38. 1850.
Echinopsis scheeri Salm-Dyck, Cact. Hort. Dyck. 1849. 179. 1850.
Echinopsis pentlandii laevior Monville in Labouret, Monogr. Cact. 290. 1853.
Echinopsis pentlandii scheeri Lemaire, Illustr. Hort. 6: with pl. 214. 1859.
Echinopsis pentlandii gracilispina Lemaire, Illustr. Hort. 6: with pl. 214. 1859.
Echinopsis pentlandii pyracantha Lemaire, Illustr. Hort. 6: with pl. 214. 1859.
Echinopsis pentlandii radians Lemaire, Illustr. Hort. 6: with pl. 214. 1859.
Echinopsis colmarii Neubert, Gartenmag. 1878.*
Echinopsis pentlandii tricolor Rümpler in Förster, Handb. Cact. ed. 2. 612. 1885.
Echinopsis pentlandii longispina Rümpler in Förster, Handb. Cact. ed. 2. 612. 1885.
Echinopsis pentlandii neuberti Rümpler in Förster, Handb. Cact. ed. 2. 613. 1885.
Echinopsis pentlandii pfersdorffii Rümpler in Förster, Handb. Cact. ed. 2. 613. 1885.
Echinopsis pentlandii cavendishii Rümpler in Förster, Handb. Cact. ed. 2. 614. 1885.
Echinocereus pentlandii Schumann in Engler and Prantl, Pflanzenfam. 3[6a]: 185. 1894.
Echinopsis pentlandii maximiliana Schumann, Gesamtb. Kakteen 229. 1897.
Echinopsis pentlandii elegans Hildmann in Schumann, Gesamtb. Kakteen 230. 1897.
Echinopsis pentlandii ochroleuca R. Meyer in Schumann, Gesamtb. Kakteen 230. 1897.
Echinopsis pentlandii vitellina Hildmann in Schumann, Gesamtb. Kakteen 230. 1897.
Echinopsis pentlandii forbesii R. Meyer, Monatsschr. Kakteenk. 7: 155. 1897.
Echinopsis cinnabarina scheeriana R. Meyer, Monatsschr. Kakteenk. 7: 164. 1897.
Echinopsis cavendishii Hortus, Monatsschr. Kakteenk. 20: 143. 1910.

Stems simple, higher than broad, somewhat umbilicate at apex, bright green or somewhat glaucous; ribs about 12, deeply crenate, rather high, broken into long acute tubercles, separated by acute intervals; spines 5 to 8, all radial, acicular, somewhat curved backward, yellowish brown, 3 cm. long or less; flowers short-funnelform, about 4 cm. long, the tube greenish; inner perianth-segments rose-

*This name and reference is taken from Schumann's monograph (Gesamtb. Kakteen 229). Schumann doubtless had in mind Deutsches Magazin für Garten und Blumenkunde 1878, but he gives no page nor do we find the name in this book. On pages 114 to 118 there is a short article on "Ein unbekannter (?) Cactus," with a colored illustration, but without legend. This illustration is reproduced by Rümpler (Förster, Hamb. Gartenz. 879. 1861) under the name of *Echinopsis colmarii.*

colored, narrowly obovate, abruptly acute, spreading; stamens and style much shorter than the inner perianth-segments; scales on ovary and flower-tube lanceolate, short-hairy in their axils; fruit subglobose, 10 to 12 mm. in diameter.

Type locality: Not cited.

Distribution: Bolivia.

We have followed Schumann who refers *Echinopsis colmarii* here. Rümpler (Förster, Handb. Cact. ed. 2. 615. 1885), however, says it comes from Mexico, which would exclude it from this alliance. Rümpler's illustrations (f. 79, 80) do not suggest this relationship, the latter resembling very much the flower of an *Echinocactus*. *Echinopsis colmariensis* (Schumann, Gesamtb. Kakteen 230. 1897) is a catalogue name for *E. colmarii*.

We have also followed Schumann in referring here *E. scheeri*, although it was originally described as having 13 to 19 ribs. Rümpler's illustration (f. 78) has long, linear perianth-segments and looks very unlike *Lobivia pentlandii*, though the plant body is very similar. *E. scheeriana* (Monatsschr. Kakteenk. 3: 127. 1893) is only a name and belongs here.

FIG. 71.—Lobivia pentlandii.

FIG. 72.—Lobivia andalgalensis.

E. pentlandii integra (Monatsschr. Kakteenk. 7: 139. 1897), *E. pentlandii achatina* (Monatsschr. Kakteenk. 14: 168. 1904), *E. columnaris*, *E. elegans vittata*, *E. ochroleuca*, *E. pfersdorffii*, and *E. achatina* (all in Monatsschr. Kakteenk. 20: 143. 1910) are unpublished names which probably belong here. *E. maximiliana longispina* (Monatsschr. Kakteenk. 20: 143. 1910) is of this relationship. *E. pentlandii cristata* (Monatsschr. Kakteenk. Index 58) is doubtless a crested form. *E. pentlandii pyrantha* Monville (Labouret, Monogr. Cact. 289. 1853) doubtless should be referred here as we have done.

Echinopsis pentlandii albiflora Weidlich (Gartenflora 69: 143. f. 17. 1920) has recently been briefly described as having white flowers, 5 cm. long and 4 cm. broad. We do not know it nor do we know its origin.

Illustrations: Curtis's Bot. Mag. 70: pl. 4124; Loudon, Encycl. Pl. ed. 3. 1376. f. 19367, as *Echinocactus pentlandii;* Blühende Kakteen 1: pl. 26; Dict. Hort. Bois f. 324; Monatsschr. Kakteenk. 13: 92. f. B; Palmer, Cult. Cact. 3; Rümpler, Sukkulenten 167. f. 91; Deutsche Gärt. Zeit. 5: 369; Möllers Deutsche Gärt. Zeit. 25: 475. f. 7, No. 1; Watson, Cact. Cult. 134. f. 52, as *Echinopsis pentlandii;* Förster, Handb. Cact. ed. 2. f. 78; Rümpler, Sukkulenten 166. f. 90, as *Echinopsis scheeri;* Förster, Handb. Cact. ed. 2. f. 79, 80, as *Echinopsis colmarii;* Lemaire, Cactées 70. f. 7; Rev. Hort. 1860: f. 109; Dict. Gard. Nicholson 1: 503. f. 698; Watson, Cact. Cult. 135. f. 53, as *Echinopsis pentlandii longispina;* (?) Lemaire, Cactées 70. f. 8; (?) Dict. Gard. Nicholson 1: 503. f. 699; Rev. Hort. 1860: f. 111, as *Echinopsis pentlandii scheeri;* Möllers Deutsche Gärt. Zeit. 25: 475. f. 7, No. 13, as *Echinopsis cinnabarina;* Rev. Hort. 1860: f. 110, as *Echinopsis pentlandii maximiliana;* Rev. Hort. 1860: f. 108, as *Echinopsis pentlandii levior scheeri;* Möllers Deutsche Gärt. Zeit. 25: 475. f. 7, No. 24, as *Echinopsis pentlandi colmari.*

Plate v, figure 3, shows a plant sent to the New York Botanical Garden from the Berlin Botanical Garden in 1902, which flowered in May 1913. Figure 71 is copied from the Botanical Magazine illustration above cited.

11. Lobivia lateritia (Gürke).

Echinopsis lateritia Gürke, Monatsschr. Kakteenk. 17: 151. 1907.

Simple, nearly globular or a little longer than broad, glaucous-green, 7.5 cm. high; ribs 18, broad at base, acute, more or less undulate, about 1 cm. high; areoles 1 to 2 cm. apart; radial spines 9 or 10, more or less curved, 10 mm. long, brownish; central spines 1 or 2, more or less curved upward, much longer than the radials, somewhat thickened at base; flowers 3 to 5 cm. long, short-funnelform, scarlet to brick-red; inner perianth-segments oblong, acute; scales on the ovary and flower-tube lanceolate, acute, bearing blackish hairs in their axils; filaments red; stigma-lobes 7 or 8.

Type locality: Bolivia.

Distribution: Bolivia.

Illustration: Blühende Kakteen 2: pl. 120, as *Echinopsis lateritia.*

Plate v, figure 4, shows a plant collected by Dr. Rose at La Paz, Bolivia, in 1914, which flowered the next year at the New York Botanical Garden; this plant differs a little from the one shown in the illustration above cited.

12. Lobivia pampana sp. nov.

More or less cespitose; plants globular, 5 to 7 cm. in diameter; ribs 17 to 21, more or less undulate; areoles distant, white-felted when young, very spiny except in cultivated plants and then often spineless; spines 5 to 20, often more or less curved, acicular, often 5 cm. long, puberulent; flowers 5.5 to 6 cm. long, red; outer perianth-segments linear-oblong, acuminate; inner perianth-segments oblong, acute to acuminate; scales on the ovary and fruit ovate, 4 to 6 mm. long, acuminate, with long white hairs in their axils.

Collected by J. N. Rose on the Pampa de Arrieros, southern Peru, August 23, 1914 (No. 18966).

13. Lobivia corbula (Herrera).

Mammillaria corbula Herrera, Rev. Univ. Cuzco 8: 61. 1919.

Nearly globular, growing in clumps of 5 to 8 plants; ribs 12 or more, strongly crenate; areoles filled with white wool; in cultivated plants few or no spines developing, but in wild plants appearing in clusters of 6 to 9, these yellowish, 3 to 5 cm. long; flowers opening in the evening, about 3 cm. long; tube short, bearing small scales, these hairy in their axils; outer perianth-segments lanceolate, acute, purplish; inner ones lanceolate, somewhat shorter and broader, acute, salmon-red; stamens and style greenish yellow, short, included; style 2.5 cm. long.

Type locality: Near Cuzco, Peru.

Distribution: On hills in the high Andean Valley of Peru.

Collected by J. N. Rose on hills at Juliaca, Peru, September 4, 1914 (No. 19090); also near Cuzco, September 2, 1914 (No. 19080), by O. F. Cook on the highlands of Peru in 1915 and by Fortunato L. Herrera near Cuzco in 1922.

Plate v, figure 2, shows a plant collected in 1914 by Dr. Rose at Juliaca, Peru, which flowered at the New York Botanical Garden in May 1916.

14. Lobivia andalgalensis (Weber).

Cereus huascha rubriflorus Weber in Schumann, Monatsschr. Kakteenk. 3: 151. 1893.
Cereus andalgalensis Weber in Schumann, Gesamtb. Kakteen 168. 1897.

Plants single or clustered, globular or a little flattened, 3 to 10 cm. in diameter, green; ribs about 13, stout, hardly crenate; areoles 5 to 10 mm. apart, circular; spines white, subulate, straight; radial spines 8 to 10, about equal, 5 to 7 mm. long; central spine solitary, stouter than the radials, 10 to 25 mm. long, porrect; flowers fugacious, short-funnelform, about 6 cm. long, green without; flower-tube and ovary bearing scales, with long, gray appressed hairs in their axils; inner perianth-segments red, oblanceolate or subspatulate, 1.8 to 2.5 cm. long, obtuse or retuse; filaments reddish purple; style pale red or yellow; stigma-lobes about 9.

M. E. Eaton del. A. Hoen & Co.

1. Top of flowering plant of *Echinocereus engelmannii*.
2. Flowering plant of *Lobivia corbula*.
3. Flowering plant of *Lobivia pentlandii*.
4. Flowering plant of *Lobivia lateritia*.

(All natural size.)

Type locality: Andalgala, province of Catamarca, Argentina.
Distribution: Western Argentina.

This plant has passed as a variety of *Cereus huascha*, now *Trichocereus huascha*, but the two are so unlike that we have referred them to different genera. Both species are still little known and further study of them is much desired.

Figure 72 is from a photograph contributed by Dr. Spegazzini; figure 75 shows a flower collected by Dr. Shafer between Andalgala and Concepción, Argentina, in 1917 (No. 27).

15. Lobivia haematantha (Spegazzini).

Echinocactus haematanthus Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 498. 1905.

Somewhat depressed, globose, 5 cm. high, 6 cm. in diameter, greenish, somewhat shining; ribs 11, somewhat tuberculate, obtuse; areoles nearly circular, 5 to 6 mm. in diameter, white-felted; radial spines 6 to 8, slender, 5 to 10 mm. long, more or less appressed; central spines 3, stouter than the radials, 5 cm. long, pale gray with yellowish tips; flowers 3 to 4 cm. broad; inner perianth-segments obovate to spatulate, obtuse, purplish; stigma-lobes 9 to 12, white; scales on ovary and flower-tube long-woolly.

FIG. 73.—Lobivia haematantha.

FIG. 74.—Lobivia thionanthus.

Type locality: Near Amblaio, province of Salta, Argentina.
Distribution: Known only from the province of Salta, Argentina.
We know the plant only from photographs and the description.
Figure 73 is from a photograph contributed by Dr. Spegazzini.

16. Lobivia grandiflora sp. nov.

Globose to short-cylindric, 7.5 to 10 cm. in diameter, 15 to 20 cm. long; ribs about 14; areoles about 1 cm. apart; spines about 15, slender, subulate, about 1 cm. long, yellowish; flowers funnel-form, 10 cm. long; perianth-segments narrow, acuminate, 4 to 5 cm. long, pink; scales on the ovary narrow, 10 to 12 mm. long, a little hairy in their axils.

Collected by J. A. Shafer between Andalgala and Concepción, Argentina, December 28, 1916, altitude 1,750 meters (No. 28).

The showy pink flowers of this plant are larger than those of any of the other species which we have included in this genus.

17. Lobivia thionanthus (Spegazzini).

Echinocactus thionanthus Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 499. 1905.

Plants usually solitary, globular to short-cylindric, grayish green, 5 to 12 cm. high, 6 to 10 cm. in diameter; ribs usually 14, low, slightly undulate and divided into indistinct tubercles; areoles short-elliptic; spines subulate, grayish or with brownish tip, about equal, 10 to 15 mm. long; flowers

obconic, 4.5 cm. long, not odorous; inner perianth-segments yellowish, 15 mm. long, elliptic, the apex subretuse or mucronate; filaments yellow; style greenish white; stigma-lobes 12, flesh-colored, a ring of dense brownish hairs within the flower-tube, below the stamens; ovary and flower-tube covered with scales, each with a reflexed cartilaginous somewhat pungent apex, very woolly in their axils.

Type locality: Near Cachi, province of Salta, Argentina.

Distribution: Known only from the type locality.

Figure 74 is from a photograph contributed by Dr. Spegazzini.

18. Lobivia chionanthus (Spegazzini).

Echinocactus chionanthus Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 499. 1905.

Plants elliptic to short-cylindric, grayish green, 6 to 7.5 cm. high, 5 to 6 cm. in diameter; ribs 13 to 15, low, rounded; areoles elliptic; spines 7 to 9, subulate, straight, grayish, all radial, somewhat appressed, 1.5 to 2 cm. long; flowers from the upper part of the plant, but not central, 4.5 cm. long; inner perianth-segments white; style green; stigma-lobes 13, white; scales on ovary and flower-tube cartilaginous, subspinescent, reflexed at apex; flower-tube with a ring of dense brown hairs near the base within.

FIG. 75.—Flower of Lobivia andalgalensis. ×0.6.

FIG. 76.—Flower of Lobivia grandis. ×0.6.

Type locality: Near Cachi, province of Salta, Argentina.

Distribution: Known only from type locality.

Of this relationship are flowers collected by A. Dominguez from the Cerro de Macha, Córdoba, Argentina; in these specimens the scales are long, linear, chartaceous, and erect; the flowers are 5 to 6 cm. long; the outer perianth-segments and often the inner have acuminate or mucronate chartaceous tips. (For further discussion see *Echinocactus spiniflorus*, page 178.)

Figure 77 is from a photograph contributed by Dr. Spegazzini.

FIG. 77.—Lobivia chionanthus.

FIG. 78.—Lobivia grandis.

19. Lobivia grandis sp. nov.

Depressed-globose to short-cylindric, 2.5 dm. high, bright green; ribs 14 to 16, prominent, 2 cm. high, broad at base, rounded on margin; areoles somewhat depressed, circular, 2 to 3 cm. apart, white-felted when young; spines 10 to 15, yellow with brown tips, acicular to slender-subulate, elongated, 6 to 8 cm. long; flowers lateral, straight, 6 cm. long, with a stout funnelform tube 2 cm. thick and a rather small limb; inner perianth-segments ovate, acuminate, subulate-tipped, 1.5 cm.

long, probably white; scales on ovary and flower-tube ovate, 10 to 12 mm. long, narrowly ovate, acute, their axils filled with long black silky hairs.

Collected by J. A. Shafer on a cliff, at an altitude of 2,400 meters, between Andalgala and Concepción, Argentina, December 28, 1916 (No. 25, type). Dr. Shafer's No. 23 collected at the same locality is similar, but the flowers are much smaller, being only about 3 cm. long, and the plant is much larger, up to 12 dm. high. This plant is referred to this genus with hesitancy; it is much larger than any of the other species.

Figure 78 is from a photograph of the plant collected by Dr. Shafer; figure 76 shows its flower.

20. Lobivia cumingii (Hopffer).

Echinocactus cumingii Hopffer, Allg. Gartenz. 11: 225. 1843.

Plants small, 5 to 6 cm. in diameter, simple, globular, bluish green, tubercled; tubercles arranged in about 18 spiraled rows; radial spines about 20, straight, 10 mm. long; central spines 2 to 8, 11 mm. long; flowers from the upper part of the plant but not central, orange-colored (sometimes shown as lemon-yellow), narrow, 2.5 cm. long; inner perianth-segments oblong, acute; scales on the ovary small, described as naked in their axils.

FIG. 79.—Lobivia cumingii.

Type locality: Mountains of Peru.

Distribution: Bolivia and Peru.

The first two illustrations cited below are so different in the shape of the tubercles and in the color and form of the flowers that we suspect that they may belong to different species. The one from the Botanical Magazine has lemon-yellow flowers, while the other has deep-orange or brick-red flowers.

We have not studied living plants of this species.

Schumann refers *Echinocactus rostratus* Jacobi (Allg. Gartenz. 24: 108. 1856) here; but it was based on specimens from Valparaiso, Chile, and is probably to be referred to *E. subgibbosus*, now taken up in another genus (see page 97).

Although this species was described by Hopffer in 1843, Salm-Dyck* much later (Cact. Hort. Dyck. 1849. 174. 1850) published it as a new species of his own. In his description he makes the significant remark that it is similar to *Echinocactus cinnabarinus* which confirms our conclusion that it is probably a *Lobivia*. In 1860 Regel and Klein (Ind. Sem. Hort. Petrop. 48. 1860) described also as a new species, *Echinocactus cumingii*. They say it was brought by Cuming from Chile and, if so, is doubtless different from our plant. They state that it was referred to *Echinocactus cinerascens*, a plant occurring in Chile, but it is certainly not that species. It may be a species of *Neoporteria*, but in any case the name is a homonym and its exact identification is not of much importance.

The type was collected by Thomas Bridges, but the plant was named for Hugh Cuming (1791-1865).

Echinocactus cumingii flavispinus (Monatsschr. Kakteenk. 14: 77. 1904) is a form.

Illustrations: (?) Curtis's Bot. Mag. 100: pl. 6097; (?) Blühende Kakteen 1: pl. 19, as *Echinocactus cumingii*.

Figure 79 is a reproduction of the second illustration cited above.

*His original was *cummingii*.

LOBIVIA sp.

Dr. Shafer collected many specimens of a plant at Villazon, Bolivia, in February 1917 (No. 86), which may represent another species of this genus, but they were at that time without flowers or fruit, and none has flowered since brought by him to the New York Botanical Garden.

This cactus is tufted, forming clumps 1 to 2 dm. broad; its joints are short-cylindric to turbinate, 8 to 15 cm. high and 5 to 7.5 cm. thick, 14 to 18-ribbed; areoles few in each rib, white-felted when young, elliptic; spines 2 to 5, somewhat flattened and appressed, about 1 cm. long, white with black tips. Dr. Shafer was told that its flowers are white.

6. ECHINOPSIS Zuccarini, Abh. Bayer. Akad. Wiss. München 2: 675. 1837.

Echinonyctanthus Lemaire, Cact. Gen. Nov. Sp. 10. 1839.

Stems usually low, rarely over 3 dm. high, usually much shorter, generally globular or short-cylindric, but some species large, columnar, either solitary or clustered, with ribs either continuous or more or less undulate; areoles usually circular, borne on the ribs, felted and spiny; flowers arising from old areoles just above the spine-clusters, with a very long narrowly funnelform tube; perianth-segments comparatively short and broad, more or less spreading, usually white, rarely yellow or rose-colored*; filaments and style projecting beyond the throat but not beyond the perianth-segments; stamens in 2 series, weak; stigma-lobes of various colors, narrow; fruit globose to ovoid or sometimes narrowly oblong, splitting open on one side; seeds minute, oblique, obovate, truncate at base.

Echinocactus eyriesii Turpin is the type of the genus.

The generic name is from ἐχῖνος hedgehog, and ὄψις appearance, referring to the armament of the plant.

Some of the species have been taken up in *Echinocactus* or *Echinonyctanthus*, many in *Cereus*, while one species, though excluded from *Echinopsis* in our treatment, has also been referred to *Cleistocactus* and *Pilocereus*.

In its flowers *Echinopsis* is like *Trichocereus* and somewhat like *Harrisia*, but in habit it is abundantly distinct from these genera. In habit, although not in flowers, it seems to be the South American counterpart of the North American genus *Echinocereus*. Gardeners and botanists generally have recognized it as a well-defined genus, but Bentham and Hooker in their Genera Plantarum reduced it to *Cereus*, and their course has been followed by some other English authors. While the genus as treated by Schumann contains mostly species of low stature there are some striking diversities in flowers and we have consequently segregated these under the generic names *Lobivia* and *Rebutia*. Schumann recognized 18 species of this genus. Von Rother states that he had 55 forms growing in his collection; some of these must have been hybrids of which there are many. We here recognize 28 species, but further field observations may prove that this number should be reduced. There are, however, more than 200 names published under *Echinopsis* to be accounted for. The known species inhabit southern South America, east of the Andes.

KEY TO SPECIES.

A. Tube of perianth distinctly longer than limb.
  B. Flowers white to red or pinkish.
    C. Spines all straight, subulate.
      Inner perianth-segments thread-like..... 1. *E. meyeri*
      Inner perianth-segments broad.
        Stems slender, cylindric, much longer than thick.
          Fruit very slender..... 2. *E. mirabilis*
          Fruit (so far as known) globular.
            Flowers 10 cm. long..... 3. *E. forbesii*
            Flowers 17 to 20 cm. long.
              Central spines 1 to 4, 4 cm. long..... 4. *E. huottii*
              Central spine solitary, 5 to 6 cm. long..... 5. *E. minuana*

*In *Echinopsis aurea* and *E. formosa* the flowers are yellow, in *E. multiplex* and *E. oxygona* red to rose.

KEY TO SPECIES—continued.

Stems globular or thicker than long or sometimes clavate, never slender.
Flowers red.
Flower-tube distinctly enlarged above, its scales distant, large..... 6. *E. multiplex*
Flower-tube slender, nearly cylindric, its scales numerous, small..... 7. *E. oxygona*
Flowers white.
Inner perianth-segments acuminate.
Spines very short or none.
Areoles nearly spineless..... 8. *E. eyriesii*
Areoles with several spines, 4 to 7 mm. long..... 9. *E. turbinata*
Spines subulate, 10 to 12 mm. long..... 10. *E. tubiflora*
Inner perianth-segments not acuminate.
Spines becoming white..... 11. *E. albispinosa*
Spines yellow to gray or brown.
Inner perianth-segments obtuse..... 12. *E. silvestrii*
Inner perianth-segments acute.
Plant small, 9 cm. in diameter or less; flower 16 cm. long..... 13. *E. calochlora*
Plant 4 to 5 dm. high, 3 to 3.5 dm. thick; flower 20 to 22 cm. long.. 14. *E. cordobensis*
CC. Spines more or less curved.
Spines very delicate, central one hooked..... 15. *E. ancistrophora*
Spines stout.
Central spine solitary.
Radial spines straight.
Plant about 9 cm. thick, 3 dm. high or less..... 16. *E. spegazziniana*
Plant up to 1.5 meters high, 16 to 18 cm. in diameter..... 17. *E. shaferi*
Radial spines curved.
Ribs strongly crenate..... 18. *E. fiebrigii*
Ribs not strongly crenate.
Flowers 15 cm. long or less..... 19. *E. rhodotricha*
Flowers 20 cm. long or more.
Central spine up to 10 cm. long..... 20. *E. leucantha*
Central spine about 2.5 cm. long..... 21. *E. obrepanda*
Central spines several.
Ribs 16; spines at first rose..... 22. *E. intricatissima*
Ribs 13 or 14; spines gray to blackish.
Flowers straight..... 23. *E. molesta*
Flowers curved..... 24. *E. baldiana*
BB. Flowers yellow..... 25. *E. aurea*
AA. Tube of perianth not longer than limb.
Ribs not undulate..... 26. *E. bridgesii*
Ribs undulate..... 27. *E. mamillosa*
AAA. Species not grouped..... 28. *E. formosa*

1. Echinopsis meyeri Heese, Gartenflora **56**: 1. 1907.

Stems globose or somewhat depressed at apex, 10 cm. in diameter, pale green; ribs 14 to 16, acute, usually straight; spines subulate, all straight, rosy below, brown or black above, but in age nearly white; radial spines 7 or 8; central spine solitary; flowers numerous, lateral, 15 to 20 cm. long; all perianth-segments long, threadlike, twisted, the outer ones brownish, the inner dull white; axils of scales on ovary and flower-tube bearing many long hairs; stigma-lobes cream-colored.

Type locality: Paraguay.

Distribution: Paraguay.

We have not seen specimens of this species, but the type was illustrated; so far as we know it is not in cultivation. This should not be confused with the *Echinopsis meyeri* which is grown in gardens and which, according to Berger, is a hybrid between *E. eyriesii* and *E. leucantha*.

This plant is remarkable among cacti for its very narrow perianth-segments.

Haage and Schmidt offer a plant under this name for sale. It suckers very freely, both on the side and near the top of the plant and these begin to send out roots while still attached to the parent plant. They are covered with short brown spines. We do not know the origin of Haage and Schmidt's consignment and we have seen only very small plants from it. As these all show several central spines, while the *E. meyeri* Heese is known to have a single central spine, there may be doubt as to their identification.

Illustration: Gartenflora **56**: pl. 1558.

Figure 80 is from a photographic copy of the illustration above cited.

2. Echinopsis mirabilis Spegazzini, Anal. Mus. Nac. Buenos Aires III. **4**: 489. 1905.

Simple, cylindric, 12 to 15 cm. high, 2 cm. in diameter, dull yellowish green; ribs 11, slightly undulate; areoles minute; spines all straight; radial spines 9 to 14, slender; central spine solitary, erect, 10 to 15 mm. long; flowers borne near the top of the plant, inodorous, 11 to 12 cm. long; inner perianth-segments white, acuminate; scales on ovary and flower-tube very woolly in their axils, thin, scarious at base, almost filiform, 8 mm. long; outer perianth-segments similar to the scales but longer; fruit 3.5 to 4 cm. long, 5 to 6 mm. in diameter; seeds globular, 1.5 mm. in diameter, with a depressed hilum.

FIG. 80.—Echinopsis meyeri.

FIG. 81.—Echinopsis mirabilis.

Type locality: Near Colonia Ceres, province of Santiago del Estero.

Distribution: Known only from province of Santiago del Estero, Argentina.

This plant is called flor de la oración.

Besides photographs of the type Dr. Spegazzini has presented us with a fruit from the type plant.

Figure 81 is from a photograph contributed by Dr. Spegazzini.

3. Echinopsis forbesii (Lehmann) A. Dietrich, Allg. Gartenz. **17**: 193. 1849.

Echinocactus forbesii Lehmann in Walpers,* Repert. Bot. **2**: 319. 1843.
Echinopsis valida Monville in Salm-Dyck, Cact. Hort. Dyck. 1849. 181. 1850.
Echinopsis valida forbesii R. Meyer in Schumann, Gesamtb. Kakteen 239. 1897.

*Walpers says: "F. A. Lehm. in Terscheck, Suppl. Cact. 2." Förster (Handb. Cact. 520. 1846) used *Echinopsis forbesii* Hort. Angl. as a synonym of *Echinocactus forbesii*, but hardly publishes it.

Usually simple, columnar, claviform, sometimes 1 meter high, 20 cm. in diameter, glaucous-green; ribs 10 to 15, acute, separated by acute intervals; areoles circular, filled with spines and short white wool; spines 8 to 15, the longest 2 cm. long, acicular, straight, pale, nearly white, except the tips, these brown; central spines 1 to several, the longest 3 to 4 cm. long, stouter than the radials. horizontal; young joints borne near the top of the plant, densely covered with yellow and brown spines intermixed with soft white hairs; flowers borne near the top of the plant, about 10 cm. long; inner perianth-segments spreading, lanceolate, acute, white.

Type locality: Not cited.

Distribution: Paraguay (*fide* Weber).

This species is known to us only from descriptions and illustrations. Schumann follows Meyer in making *E. forbesii* a variety of *E. valida.* We have united the two and taken the older specific name.

The species was named for James Forbes (1773–1861), an enthusiastic student of cacti and gardener for the Duke of Bedford at Woburn Abbey.

Cereus validissimus Weber (Dict. Hort. Bois 473. 1896) is given as a synonym of *E. valida.*

Illustrations: Monatsschr. Kakteenk. 5: 117; Palmer, Cult. Cact. 151; Möllers Deutsche Gärt. Zeit. 25: 475. f. 7, No. 17, as *Echinopsis valida.*

4. **Echinopsis huottii** (Cels) Labouret, Monogr. Cact. 301. 1853.

Echinocactus huotti Cels, Portef. Hort. 216. 1847.
Echinopsis apiculata Linke, Wochenschr. Gärtn. Pflanz. 1: 85. 1858.

Plants simple, slender, up to 3.5 dm. high, short-columnar, dull green; ribs 9 to 11, crenate; radial spines 9 to 11, acicular, 2 cm. long or more; central spines normally 4, brown, 4 cm. long, subulate, porrect; flowers lateral, large, 17 to 20 cm. long, white; stamens included, greenish below, white above; style green; stigma-lobes 14, green.

Type locality: Cited as Chile (*fide* Labouret), but doubtless wrongly.

Distribution: Bolivia (*fide* Linke and Schumann).

It does not seem close to any of the other species. It is quite different from the Bolivian species collected by Dr. Rose at La Paz, Bolivia, which we have referred to *E. bridgesii.* (See page 74.)

We have studied a plant sent to the New York Botanical Garden from the Berlin Botanical Garden in 1902; in this there is only one central spine at each areole.

Schlumberger (Rev. Hort. IV. 3: 348. 1854) calls this *Echinopsis kuottii,* doubtless a typographical error.

Cereus huottii Cels and *Echinopsis verschaffeltii* (Dict. Hort. Bois 471. 1896) are given as synonyms of this species by Weber.

Illustrations: Möllers Deutsche Gärt. Zeit. 25: 475. f. 7, No. 11, as *Echinopsis apiculata;* Schumann, Gesamtb. Kakteen f. 45; Gartenwelt 17: 145.

5. **Echinopsis minuana** Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 488. 1905.

Simple or rarely proliferous at base, columnar, 5 to 8 dm. high, 14 to 15 cm. in diameter; ribs 12, straight, a little undulate; spines all straight, dark brown to chestnut-colored; radial spines 4 to 7, short, 2 to 3 cm. long; central spine solitary, stouter than the radials, bulbose at base, 5 to 6 cm. long; flowers large, inodorous, 20 cm. long; inner perianth-segments oblanceolate, 4.5 cm. long; filaments and style greenish white; stigma-lobes 17 or 18, greenish white; fruit subglobose, 4.5 cm. long, greenish red.

Type locality: Bank of Paraná River, province of Entre Rios, Argentina.

Distribution: Province of Entre Rios, eastern Argentina.

We know this species only from description and a photograph taken by Dr. Spegazzini.

6. **Echinopsis multiplex** (Pfeiffer) Zuccarini in Pfeiffer and Otto, Abbild. Beschr. Cact. 1: pl. 4. 1839.

Cereus multiplex Pfeiffer, Enum. Cact. 70. 1837.
Echinonyctanthus multiplex Lemaire, Cact. Gen. Nov. Sp. 85. 1839.

Plants simple or very proliferous, globular to somewhat clavate, rounded at apex, 1.5 dm. high; ribs 13 to 15, broad at base, acute, slightly undulate; areoles large, filled with short white wool; spines brown, subulate; radial spines 5 to 15, ascending, 2 cm. long; central spines 2 to 5, 4 cm. long; flower 15 to 20 cm. long, its tube distinctly enlarged above, its scales large, distinct; inner perianth-segments broad, rose-colored, acuminate; stamens and style much shorter than perianth-segments, but exserted beyond the throat; stigma-lobes white, slender, 6 or 7.

Type locality: Southern Brazil.

Distribution: Southern Brazil.

This species may not be distinct from the following one. In collections of cacti, plants apparently intermediate in character are frequently found, as well as many hybrids.

Pfeiffer (Enum. Cact. 70. 1837) gives *Echinocactus multiplex* as a synonym of *Cereus multiplex*, while the name was in use in the Botanical Garden in Berlin in 1829 (Verh. Ver. Beförd. Gartenb. 6: 431. 1830). On the following page he describes the variety *monstrosus*. Other forms have been described as var. *cossa*, *picta*, and *cristata* under *Echinopsis multiplex*.

This plant is common in cultivation. Some of the illustrations cited for this and the two following species may represent hybrid plants with one of these species as one of the parents.

Illustrations: Watson, Cact. Cult. 80. f. 25; Dict. Gard. Nicholson 4: 512. f. 11, as *Cereus multiplex cristatus;* Dict. Gard. Nicholson Suppl. f. 365; Förster, Handb. Cact. ed. 2. f. 9; Grässner, Haupt-Verz Kakteen 1912: 16; Gard. Chron. III. 29: f. 80; Schelle, Handb. Kakteenk. f. 48; Möllers Deutsche Gärt. Zeit. 25: 475. f. 7, No. 12, as *Echinopsis multiplex cristata;* Dict. Gard. Nicholson 4: 512. f. 10; Curtis's Bot. Mag. 66: pl. 3789; Watson, Cact. Cult. 79. f. 24, as *Cereus multiplex;* Monatsschr. Kakteenk. 16: 89, as *Echinopsis multiplex monstrosa;* Monatsschr. Kakteenk. 6: 103; Pfeiffer and Otto, Abbild. Beschr. Cact. 1: pl. 4; Förster, Handb. Cact. ed. 2. 139. f. 8; Dict. Gard. Nicholson Suppl. f. 364; Rümpler, Sukkulenten 168. f. 92; Garden 84: 133; Möllers Deutsche Gärt. Zeit. 25: 475. f. 7, No. 6.

Plate VI, figure 2, shows a flowering plant in the collection of the New York Botanical Garden, received from the Missouri Botanical Garden.

7. **Echinopsis oxygona** (Link) Zuccarini in Pfeiffer and Otto, Abbild. Beschr. Cact. 1: under pl. 4. 1839.

Echinocactus oxygonus Link in Link and Otto, Verh. Ver. Beförd. Gartenb. 6: 419. 1830.
Cereus oxygonus Pfeiffer, Enum. Cact. 70. 1837.
Echinocactus octogonus G. Don in Sweet, Hort. Brit. ed. 3. 283. 1839.
Echinonyctanthus oxygonus Lemaire, Cact. Gen. Nov. Sp. 85. 1839.

Plants subglobose, simple or somewhat clustered, about 25 cm. in diameter, somewhat glaucous; ribs 14, broad at base, rounded on back; spines about 14, short and stout, 2 to 4 cm. long; flowers usually from areoles halfway up the side of the plant, sometimes nearly 3 dm. long, the tube slender, nearly cylindric, its scales numerous and small; inner perianth-segments pale red, acute or acuminate.

Type locality: Southern Brazil.

Distribution: Southern Brazil, Uruguay, and northeastern Argentina.

Pfeiffer (Enum. Cact. 70. 1837) and also Steudel referred *Echinocactus sulcatus* as a synonym of this species. *E. sulcatus* Link and Otto (Steudel, Nom. ed. 2. 1: 537. 1840) is supposed to be different from the last, but in any case it is only a name.

Echinopsis sulcata occurs as a name in a paper by Wercklé (Monatsschr. Kakteenk. 15: 180. 1905).

Echinopsis wilkensii (*E. eyriesii wilkensii* Linke), *E. rohlandii*, and *E. lagemannii* Dietrich (*E. eyriesii lagemannii* Dietrich) are all mentioned by Schumann (Gesamtb. Kakteen 235. 1897) as hybrids of which *E. oxygona* is one of the parents. Schelle (Handb.

M. E. Eaton del. A.Hoen & Co

1. Top of flowering plant of *Echinopsis turbinata*.
2. Flowering plant of *Echinopsis multiplex*.

(All natural size.)

Kakteenk. 112. 1907) lists the following as hybrids with this species and *E. eyriesii*: *E. triumphans*, *E. nigerrima*, and *E. undulata*. *Echinopsis roehlandii* is figured in the Revue Horticole (**85**: pl. opp. 304).

Two varieties, *inermis* and *subinermis*, are sometimes given under this species. *E. oxygona turbinata* Mittler (Labouret, Monogr. Cact. 306. 1853) is considered a hybrid.

Illustrations: Möllers Deutsche Gärt. Zeit. **16**: 80; **25**: 475. f. 7, No. 3, as *Echinopsis lagemannii;* Curtis's Bot. Mag. **71**: pl. 4162; Edwards's Bot. Reg. **20**: pl. 1717; Verh. Ver. Beförd. Gartenb. 6: pl. 1, as *Echinocactus oxygonus;* Schelle, Handb. Kakteenk. 114. f. 49; Cact. Journ. **1**: pl. 6; Pfeiffer, Abbild. Beschr. Cact. **2**: pl. 4; Möllers Deutsche Gärt. Zeit. **25**: 475. f. 7, No. 2; Gartenwelt **1**: 283.

Figure 82 is from a photograph, contributed by Dr. Spegazzini.

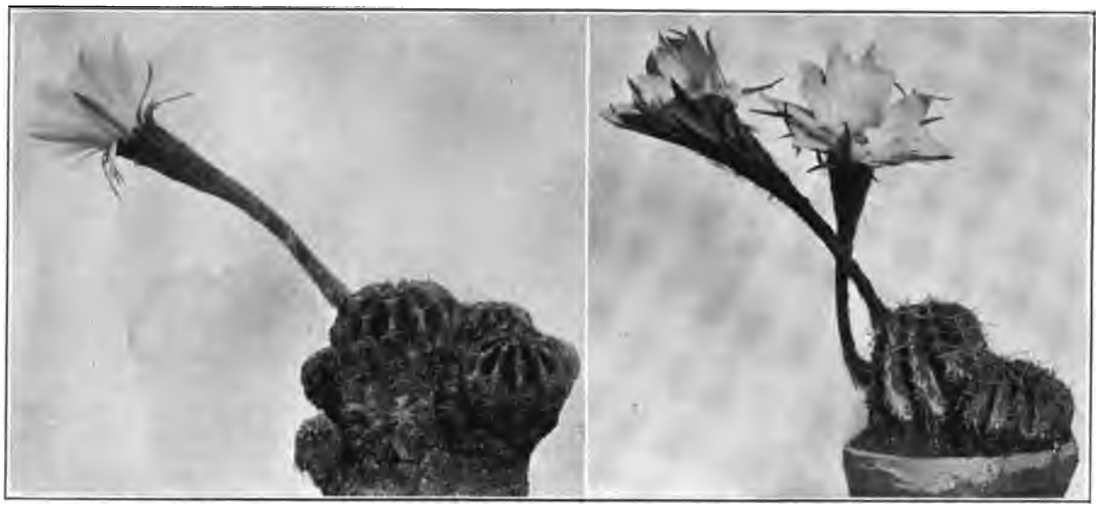


FIG. 82.—Echinopsis oxygona.

FIG. 83.—Echinopsis tubiflora.

8. Echinopsis eyriesii (Turpin) Zuccarini in Pfeiffer and Otto, Abbild. Beschr. Cact. **1**: under pl. 4. 1839.

Echinocactus eyriesii Turpin,* Ann. Inst. Roy. Hort. Fromont **2**: 158. 1830.
Cereus eyriesii Pfeiffer, Enum. Cact. 72. 1837.
Echinonyctanthus eyriesii Lemaire, Cact. Gen. Nov. Sp. 84. 1839.
Echinopsis pudantii Pfersdorf, Monatsschr. Kakteenk. **10**: 167. 1900.

Simple or clustered, globular to short-columnar; ribs 11 to 18, not tuberculate, rather thin above; areoles circular, filled with white or tawny wool; spines several, 14 to 18, very short, 5 mm. long or less; flower from the side of plant but above the middle, large, 17 to 25 cm. long; inner perianth-segments white, acuminate; stamens and style shorter than the perianth-segments; scales on the flower-tube small, ovate, brownish, hairy in their axils.

Type locality: Buenos Aires, according to Pfeiffer.

Distribution: Southern Brazil, Uruguay, and province of Entre Rios, Argentina.

The following varieties have been published, some well-known hybrids, others mere forms; var. *cristata* (Monatsschr. Kakteenk. **2**: 27. 1902); vars. *glauca* and *glaucescens* (Förster, Handb. Cact. 360. 1846); vars. *tettavii* and *triumphans* Jacobi (Förster, Handb. Cact. ed. 2. 626, 630. 1885), sometimes given as *Echinopsis triumphans* (Monatsschr. Kakteenk. **15**: 33. 1905) and var. *grandiflora* R. Meyer (Monatsschr. Kakteenk. **21**: 186. 1911). Schelle (Handb. Kakteenk. 111, 112. 1907) gives the following varieties besides two quadrinomials: *major*, *rosea* Link, *cristata*, *phyligera*, and *duvallii*.

* The reference for this species is usually cited as "Obs. Cact. 58," referring to a paper by Turpin entitled "Observations sur la Famille des Cactées, etc." in three parts which appeared in the above cited volume.

Echinopsis eyriesii inermis is in the trade (Grässner).

In cultivation this plant buds freely, sometimes producing at the same time a dozen or more small spiny buds which, dropping to the ground, start new plants. These appear only at the areoles, sometimes at the top and sometimes near the bottom of the old plant. This species has long been a favorite with gardeners.

This species was named for Alexander Eyries of Havre, France.

Illustrations: Edwards's Bot. Reg. **20**: pl. 1707; Curtis's Bot. Mag. **62**: pl. 3411; Loudon, Encycl. Pl. ed. 2 and 3. 1201. f. 17353; Ann. Inst. Roy. Hort. Fromont **2**: pl. 2, as *Echinocactus eyriesii;* Edwards's Bot. Reg. **24**: pl. 31, as *Echinocactus eyriesii glaucus;* Monatsschr. Kakteenk. **10**: 166; Schumann, Gesamtb. Kakteen Nachtr. f. 10, as *Echinopsis pudantii;* Deutsches Mag. Gart. Blumen. **1855**: opp. 112, as *Echinopsis tettavii;* Förster, Handb. Cact. ed. 2. 627. f. 83, as *Echinopsis eyriesii tettavii;* Förster, Handb. Cact. ed. 2. f. 84; Rümpler, Sukkulenten 171. f. 94, as *Echinopsis eyriesii triumphans;* Dict. Gard. Nicholson **4**: 541. f. 26; Suppl. 337. f. 363, as *Echinopsis eyriesii flore-pleno;* Schelle, Handb. Kakteenk. f. 46; Möllers Deutsche Gärt. Zeit. **25**: 475. f. 7, No. 4; Garten-Zeitung **4**: 182. f. 42, No. 12; Anal. Mus. Nac. Montevideo **5**: pl. 27; Blühende Kakteen **2**: pl. 72; Engler and Prantl, Pflanzenfam. 3^{6a}: f. 59, C; Förster, Handb. Cact. ed. 2. f. 82; Gartenflora **28**: 373; Schumann, Gesamtb. Kakteen f. 10; Martius, Fl. Bras. 4^2: pl. 47; Rümpler, Sukkulenten f. 93; Cact. Journ. **1**: pl. 6; **2**: 7.

9. Echinopsis turbinata Zuccarini in Pfeiffer and Otto, Abbild. Beschr. Cact. **1**: under pl. 4. 1839.

Cereus turbinatus Pfeiffer, Allg. Gartenz. 3: 314. 1835.
Echinonyctanthus turbinatus Lemaire, Cact. Gen. Nov. Sp. 84. 1839.
Echinonyctanthus turbinatus pictus Monville in Lemaire, Cact. Gen. Nov. Sp. 84. 1839.
Echinopsis gemmata Schumann in Martius, Fl. Bras. 4^2: 231. 1890.

Simple or somewhat clustered, globose; ribs 13 or 14, broad at base, hardly undulate; spines several, 7 mm. long or less; flowers appearing from upper areoles, about 15 cm. long, with a strong odor of jasmine and citron; inner perianth-segments white, acuminate; stamens and style shorter than the perianth-segments, but projecting beyond the throat; scales on tube and ovary small, woolly in their axils.

Type locality: Not cited.

Distribution: Province of Entre Rios, Argentina.

Cereus jasmineus and *Echinocactus turbinatus* (Pfeiffer, Enum. Cact. 72. 1837), as synonyms for *Cereus turbinatus*, doubtless belong here.

Echinocactus gemmatus Link and Otto (Verh. Ver. Beförd. Gartenb. **6**: 431. 1830), only a name, is doubtless to be referred here, while *Cereus gemmatus* Otto (Allg. Gartenz. **3**: 314. 1835, not Verh. Ver. Beförd. Gartenb. **6**: 431. 1830, as cited by Schumann) was published as a synonym of *Cereus turbinatus*. For this reason we have substituted *Echinopsis turbinata* for *E. gemmata*, the name generally used for this plant.

Walpers refers to the following as an undescribed species: *Echinopsis picta* Walpers (Repert. Bot. **2**: 324. 1843; *Echinonyctanthus pictus* Lemaire, Cact. Gen. Nov. Sp. 84. 1839, *fide* Walpers, but in error), as synonym. This probably belongs here also. *Echinopsis turbinata picta* (Walpers, Repert. Bot. **2**: 275. 1843) is only a listed name.

Of this relationship are the following: *Echinopsis schelhasii* Pfeiffer and Otto (Abbild. Beschr. Cact. **1**: under pl. 4. 1839; *Echinonyctanthus schelhasii* Lemaire, Cact. Gen. Nov. Sp. 84. 1839*), *Cereus schelhasii* Pfeiffer (Allg. Gartenz. **3**: 314. 1835), *Echinopsis schelhasei rosea* Rümpler (Förster, Handb. Cact. ed. 2. 623. 1885), *Echinopsis gemmata schelhasei* (Schelle, Handb. Kakteenk. 113. 1907), *Echinopsis decaisneana* Walpers (Repert. Bot. **2**: 324. 1843; *Echinonyctanthus decaisnianus* Lemaire, Cact. Gen. Nov. Sp. 55. 1839; *Echinocactus decaisnei* Steudel, Nom. ed. 2. **1**: 536. 1840; *Echinopsis gemmata decaisneana* Schelle, Handb. Kakteenk. 113, 1907), *Echinopsis jamessiana* (Salm-Dyck, Cact. Hort. Dyck. 1849. 38. 1850) and *Echinopsis falcata* Rümpler (Förster, Handb. Cact. ed. 2. 622. 1885).

* According to Walpers, but in error.

Echinopsis decaisneana is a delicately fragrant, beautiful pink form with large flowers; the inner perianth-segments are oblong, acute or acuminate. It is a hybrid between this and some other species. The flowers open during the day and last usually for more than one day.

Illustrations: Cact. Journ. 1: 59; 2: 169, as *Cereus gemmatus;* Möllers Deutsche Gärt. Zeit. 25: 475. f. 7, No. 14, as *Echinopsis gemmata cristata;* Cycl. Amer. Hort. Bailey 2: f. 749; Stand. Cycl. Hort. Bailey 2: f. 1377; Möllers Deutsche Gärt. Zeit. 25: 475. f. 7, No. 23; Tribune Hort. 4: pl. 139; Gartenwelt 7: 289; U. S. Dept. Agr. Bur. Pl. Ind. Bull. 262: pl. 10, as *Echinopsis gemmata;* Dict. Gard. Nicholson 1: 502. f. 697; Förster, Handb. Cact. ed. 2. 621. f. 81, as *Echinopsis decaisneana;* Pfeiffer, Abbild. Beschr. Cact. 2: pl. 7.

Plate VI, figure 1, shows a plant in the collection of the New York Botanical Garden.

10. Echinopsis tubiflora (Pfeiffer) Zuccarini in A. Dietrich, Allg. Gartenz. 14: 306. 1846.

Cereus tubiflorus Pfeiffer, Enum. Cact. 71. 1837.
Echinopsis zuccarinii Pfeiffer in Pfeiffer and Otto, Abbild. Beschr. Cact. 1: under pl. 4. 1839.
Echinocactus tubiflorus Hooker in Curtis's Bot. Mag. 65: pl. 3627. 1839.
Echinonyctanthus tubiflorus Lemaire, Cact. Gen. Nov. Sp. 85. 1839.
Echinonyctanthus tubiflorus nigrispinus Lemaire, Cact. Gen. Nov. Sp. 85. 1839.
Echinopsis nigrispina Walpers, Repert. Bot. 2: 324. 1843.
Echinopsis melanacantha Dietrich, Allg. Gartenz. 14: 306. 1846.
Echinopsis grandiflora Linke, Allg. Gartenz. 25: 239. 1857.
Echinopsis tubiflora paraguayensis R. Meyer, Monatsschr. Kakteenk. 23: 153. 1913.

Simple or clustered, subglobose, about 12 cm. in diameter; ribs about 12, prominent, slightly undulate; areoles circular, filled with white wool; spines subulate, black, 10 to 12 mm. long; flowers from the side of the plant, 15 to 20 cm. long; inner perianth-segments spreading, white, acuminate; filaments and style projecting a little beyond the throat; axils of scales on flower-tube bearing long wool.

Type locality: Not cited.

Distribution: Provinces of Tucuman, Catamarca, and Salta, Argentina; recorded from Brazil.

Pfeiffer (Enum. Cact. 71. 1837) gives *Echinocactus tubiflorus* as a synonym of *Cereus tubiflorus.*

Salm-Dyck (Cact. Hort. Dyck. 1849. 39. 1850) gives *Echinopsis zuccariniana* Pfeiffer instead of *E. zuccarinii* and Rümpler uses this spelling. Under *E. zuccariniana* several floral and abnormal forms have been described as varieties, among which are *rosea, cristata, monstrosa, picta, rohlandii,* and *nigrispina* and under *E. zuccarinii, monstruosa, nigrispina,* and *picta;* some of the same varieties appear under *E. tubiflora* including *nigrispina, rosea,* and *rohlandii.* Walpers (Repert. Bot. 2: 324. 1843) credits the name *Echinonyctanthus nigrispinus* to Lemaire, but Lemaire used the name *nigrispinus* only as a variety of *E. tubiflorus.*

Echinopsis droegeana Berger (Monatsschr. Kakteenk. 1: 24. 1891) is probably a hybrid with this species as one of the parents.

Echinopsis zuccarinii robusta is in the trade (Grässner).

Illustrations: Hartinger, Parad. 1: 8, as *Cereus tubiflorus;* Curtis's Bot. Mag. 65: pl. 3627, as *Echinocactus tubiflorus;* Möllers Deutsche Gärt. Zeit. 16: 80, as *Echinopsis tubiflora* hybrid; Monatsschr. Kakteenk. 4: 27, as *E. zuccariniana rohlandii;* Belg. Hort. 16: pl. opp. 130, as *Echinopsis zuccariniana;* Schelle, Handb. Kakteenk. f. 50; Floralia 42: 372.

Figure 83 is from a photograph contributed by Dr. Spegazzini.

11. Echinopsis albispinosa Schumann, Monatsschr. Kakteenk. 13: 154. 1903.

Low, simple or somewhat cespitose, almost globular; ribs 10 or 11, slightly undulating; spines 11 to 14, at first reddish brown, becoming white, somewhat ascending; flowers white, 19.5 cm. long, as long or longer than the plant itself; scales on flower-tube and ovary bearing cobwebby hairs in their axils.

Type locality: Not cited.

Distribution: Supposed to have come from Bolivia or Paraguay, probably from the latter.

We have seen no specimens of this species, but the first illustration cited below is of the type specimen.

Illustrations: Monatsschr. Kakteenk. 13: 155; Möllers Deutsche Gärt. Zeit. 25: 475. f. 7, No. 22.

12. Echinopsis silvestrii Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 486. 1905.

Stems simple or somewhat clustered, 5 to 10 cm. high, 4 to 8 cm. in diameter; ribs 12 to 14; spines rather stout and short, grayish; radial spines 5 to 9, appressed; central spine solitary, erect; flowers inodorous, 20 cm. long; inner perianth-segments obtuse, white; style white; stigma-lobes 9, white.

Type locality: Mountains between the provinces of Tucuman and Salta, Argentina.

Distribution: Northwestern Argentina.

This species was named for Dr. Philip Silvestri, a friend of Dr. Spegazzini.

Plate VII, figure 1, shows a plant brought from Salta, Argentina, by Dr. Shafer in 1917 (No. 41) which flowered in the New York Botanical Garden in June 1918. Figure 84 is from a photograph contributed by Dr. Spegazznii.

FIG. 84.—Echinopsis silvestrii.

FIG. 85.—Echinopsis calochlora.

13. Echinopsis calochlora Schumann, Monatsschr. Kakteenk. 13: 108. 1903.

Plants small, nearly globular, 6 to 9 cm. in diameter, deep green; ribs 13, broad, strongly crenate, separated by narrow intervals; areoles 10 to 15 cm. long, sunken in the ribs; radial spines acicular, yellow, 10 to 14, ascending; central spines 3 or 4, similar to the radials; flowers lateral, appearing above the middle of the plant, 16 cm. long; the tube only a little broader at top than at base, greenish yellow; inner perianth-segments broad, acute, white; stamens exserted beyond the tube; stigma-lobes green.

1. Top of flowering plant of *Echinopsis silvestrii*. 2. Top of flowering plant of *Echinopsis leucantha*. (All natural size.)

Type locality: Corumba, Brazil.

Distribution: Province of Goyaz, Brazil.

Illustrations: Blühende Kakteen **2**: pl. 61; U. S. Dept. Agr. Bur. Pl. Ind. Bull. **262**: pl. 3; Schelle, Handb. Kakteenk. f. 52.

Figure 85 is copied from the first illustration above cited.

14. Echinopsis cordobensis Spegazzini, Anal. Mus. Nac. Buenos Aires III. **4**: 489. 1905.

Plants simple, large, 4 to 5 dm. high, 3 to 3.5 dm. thick, ellipsoid. dull green, somewhat glaucous; ribs 13, straight, acute, stout, not crenate; spines all straight, at first dark, then gray; radial spines 8 to 10, 10 to 20 mm. long; central spines 1 to 3, the lower one largest, 3 to 5 cm. long, bulbose at base; flowers erect, with little or no odor, 20 to 22 cm. long; axils of scales on ovary and flower-tube villous; inner perianth-segments white, acute; fruit globose, 2.5 cm. long, yellowish red.

Type locality: Near Villa Mercedes, province of Córdoba, Argentina.

Distribution: Rare in province of Córdoba, Argentina.

FIG. 86.—Echinopsis ancistrophora.

15. Echinopsis ancistrophora Spegazzini, Anal. Mus. Nac. Bueno; Aires III. **4**: 492. 1905.

Stem simple, subglobose, 5 to 8 cm. in diameter, shining greens ribs 15 or 16, stout, 1 cm. high, broad at base, somewhat crenate; radial spines 3 to 7, slender, spreading backward, 5 to 15 mm. long; central spine solitary, more or less curved or hooked, 1 to 2 cm. long; flowers inodorous, 12 to 16 cm. long; outer perianth-segments green, linear, acuminate; inner perianth-segments white, oblong, acute; fruit ellipsoid, 1.6 cm. long, 8 mm. in diameter; scales on ovary and flower-tube small, their axils lanate.

Type locality: Between Tucuman and Salta, Argentina.

Distribution: The high mountains between the provinces of Tucuman and Salta, Argentina.

We have not seen specimens of this species, which Spegazzini says is rare.

Figure 86 is from a photograph contributed by Dr. Spegazzini.

16. Echinopsis spegazziniana sp. nov.

Stem simple, slender, dull green, about 3 dm. high and 9 cm. thick; ribs 12 to 14, low, slightly crenate; radial spines 7 or 8, straight, subulate, brown; central spine one, a little curved, much longer than the radials, 2 cm. long; flowers lateral, from near the middle of the plant, 15 to 17 cm. long; perianth-segments short, broad, acute, white; scales on ovary and tube small, very hairy in their axils.

This species which was found near Mendoza, Argentina, was first identified as *Echinopsis salpingophora* by Von Preinreich (Monatsschr. Kakteenk. **3**: 163. 1893) and later as *E. campylacantha* by R. Meyer (Monatsschr. Kakteenk. **5**: 27. 1895), both erroneously.

Illustrations: Monatsschr. Kakteenk. **3**: 161, as *E. salpingophora;* Schumann, Gesamtb. Kakteen f. 46, as *E. campylacantha.*

Figure 88 is from a photograph contributed by Dr. Spegazzini.

17. Echinopsis shaferi sp. nov.

Simple, erect, cylindric, up to 1.5 meters high, 16 to 18 cm. in diameter, dark green; ribs 10 to 12, 2 cm. high, separated by acute intervals; areoles approximate, 1 cm. apart or less; radial spines straight, at first brownish, but gray in age, slender, subulate, 6 to 9, 1.5 to 3.5 cm. long, somewhat spreading;

FIG. 87.—Fruit of Echinopsis shaferi. Natural size.

central spine solitary, 10 cm. long or less, ascending, somewhat curved, the upper ones more or less connivent over the top of the plant; flower slender, funnelform, 2 dm. long, white; filaments and style pale green; fruit ovoid, 3 cm. long, brick-red.

Collected by J. A. Shafer in sandy thickets, Trancas, Tucuman, Argentina, February 11, 1917 (No. 101).

This is the largest species of the genus known to us. It flowered at the New York Botanical Garden in June 1920. In the new growth the top is very woolly. The top

FIG. 88.—Echinopsis spegazziniana.

of the growing plant is covered with a mass of brown wool arising from the closely set young areoles.

John Adolph Shafer (1863–1918), an enthusiastic botanical collector, was commissioned by Dr. Britton to visit Argentina in the winter of 1916–1917 and he obtained plants and specimens of great importance in our studies of the cacti.

Figure 89 is from a photograph taken by Dr. Shafer at Trancas, Argentina, in 1917; figure 87 shows the fruit of the plant photographed.

18. Echinopsis fiebrigii Gürke, Notizbl. Bot. Gärt. Berlin 4: 184. 1905.

Stems simple, depressed-globose, 9 cm. high, 15 cm. broad; ribs 18 to 24, strongly crenate, broken into long tubercles, 1.5 cm. high; radial spines 8 to 10, 10 to 25 mm. long, recurved; central spine one, curved, ascending; flowers 17 to 19 cm. long, the tube nearly cylindric; outer perianth-segments green, spreading; inner perianth-segments white, short, broad, obtuse or truncate; filaments white; style green; stigma-lobes 11, green, 15 to 17 mm. long.

Type locality: Bolivia.

Distribution: Bolivia.

The plant is known to us only from description and illustrations.

FIG. 89.—Echinopsis shaferi.

Illustrations: Blühende Kakteen **2**: pl. 100; Monatsschr. Kakteenk. **16**: 27; Möllers Deutsche Gärt. Zeit. **25**: 475. f. 7, No. 10.

Figure 90 is copied from the first illustration above cited.

19. Echinopsis rhodotricha Schumann, Monatsschr. Kakteenk. **10**: 147. 1900.

Echinopsis rhodotricha robusta R. Meyer, Monatsschr. Kakteenk. **24**: 113. 1914.

Cespitose, dull grayish green, with 8 to 10 erect or ascending cylindric stems, 3 to 8 dm. high, 9 cm. in diameter, or sometimes simple in cultivation; ribs 8 to 13, rather low, a little sinuate; areoles 15 to 25 mm. apart; radial spines 4 to 7, widely spreading, a little curved, yellowish with brown tips, 2 cm. long; central spine one, 2.5 cm. long, shorter than the radials, or wanting, somewhat bent upward; flowers 15 cm. long; inner perianth-segments white, oblong, acute; stigma-lobes linear, 11, green.

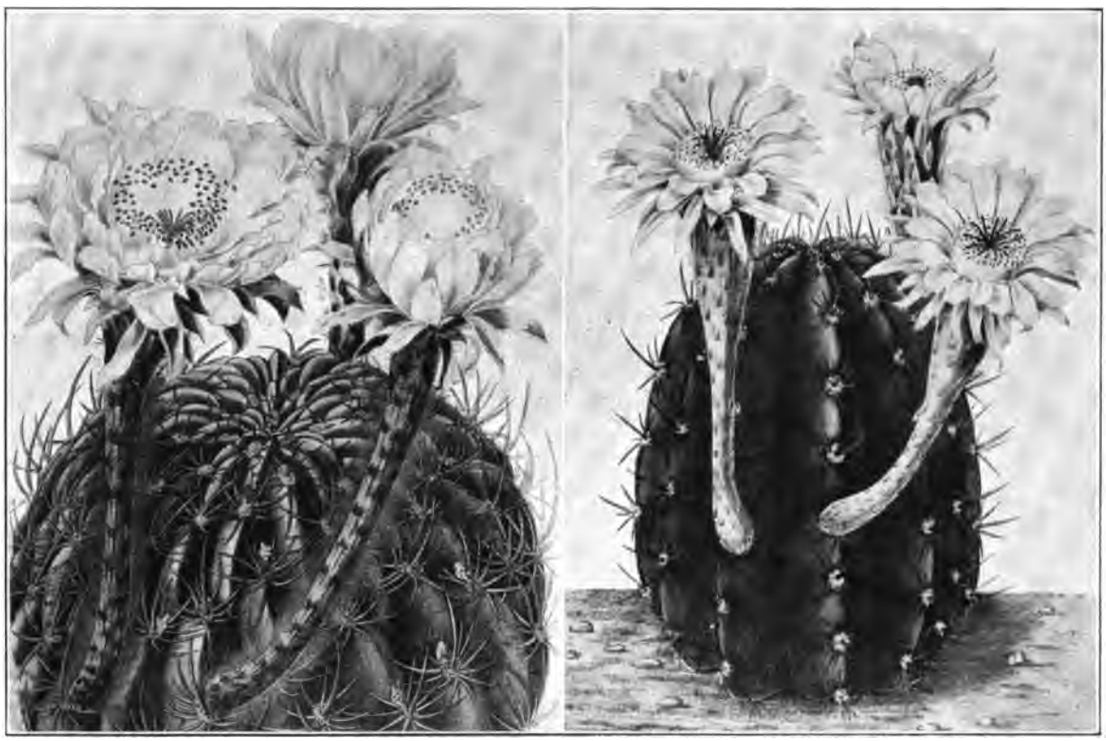


FIG. 90—Echinopsis fiebrigii.

FIG. 91.—Echinopsis rhodotricha.

Type locality: Arroyo La Cruz, near San Salvador, Rio Tagatiya-mi, Paraguay.

Distribution: Paraguay and northeastern Argentina.

Spegazzini states (Anal. Mus. Nac. Buenos Aires III. **4**: 488. 1905) that Schumann first named this species *Echinopsis spegazzinii*, but as such it has not been formally published.

The variety *Echinopsis rhodotricha argentiniensis* R. Meyer (Monatsschr. Kakteenk. **21**: 188. 1911) seems to differ from the type in its shorter, darker stems with radial spines. It was introduced from Argentina and is now offered in the trade.

The variety *Echinopsis rhodotricha roseiflora* Schumann (Bull. Herb. Boiss. II. **3**: 251. 1903) comes from near Concepción, Paraguay, and is described as having pale rose-colored inner perianth-segments.

The variety *robusta* is offered for sale by R. Grässner.

The plant is known to us only from description and illustrations.

Illustrations: Blühende Kakteen 2: pl. 76; Schumann, Gesamtb. Kakteen Nachtr. f. 11; Monatsschr. Kakteenk. 11: 139; Möllers Deutsche Gärt. Zeit. 25: 475. f. 7, No. 8. Figure 91 is copied from the first illustration above cited.

20. Echinopsis leucantha (Gillies) Walpers, Repert. Bot. 2: 324. 1843.

Echinocactus leucanthus Gillies in Salm-Dyck, Hort. Dyck. 341. 1834.
Cereus incurvispinus Otto and Dietrich, Allg. Gartenz. 3: 244. 1835.
Cereus leucanthus Pfeiffer, Enum. Cact. 71. 1837.
Echinonyctanthus leucanthus Lemaire, Cact. Gen. Nov. Sp. 85. 1839.
Echinopsis campylacantha Pfeiffer in Pfeiffer and Otto, Abbild. Beschr. 1: under pl. 4. 1839.
*Echinopsis salpigophora** Lemaire in Salm-Dyck, Cact. Hort. Dyck. 1849. 181. 1850.
Echinopsis polyacantha Monville in Labouret, Monogr. Cact. 302. 1853.
Echinopsis campylacantha leucantha Labouret, Monogr. Cact. 305. 1853.
Echinopsis campylacantha stylodes Monville in Labouret, Monogr. Cact. 305. 1853.
Echinopsis simplex Niedt, Allg. Gartenz. 25: 237. 1857.
Echinopsis melanopotamica Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 492. 1905.

Stems globose to oblong, about 3.5 dm. high; ribs 12 to 14, somewhat compressed; areoles close together, oblong; radial spines 8, more or less curved, brownish; central spine 1, curved, elongated, often 10 cm. long; flowers about 16 cm. long, described as up to 20 cm. long; the tube about 3 cm. broad at the mouth, dark brown, with scattered areoles bearing small tufts of brown hairs; outer perianth-segments brownish, spreading, 2 cm. long, with an acute scarious tip; inner perianth-segments in about 3 series, spreading, the outer ones purplish, the innermost ones nearly white, oblong, acute, about 3 cm. long; filaments in many series of many lengths, the series at the mouth of the flower-tube erect, 1.5 cm. long; style included; stigma-lobes numerous, green.

Type locality: Mendoza (*fide* Pfeiffer).

Distribution: Western Argentina.

Weber (Dict. Hort. Bois 471. 1896) gives *Echinopsis yacutulana* Weber as a synonym of *E. leucantha*. *Echinocactus salpingophora* (Labouret, Monogr. Cact. 302. 1853) was given as a synonym of *Echinopsis salpingophora*.

Although *Echinocactus leucanthus*, with *Melocactus ambiguus* Pfeiffer as a synonym, appeared in 1833 (Allg. Gartenz. 1: 364), it was not actually published until the following year.

Echinopsis polyacantha Monville (Labouret, Monogr. Cact. 302. 1853) and *E. stylosa* Monville (Schumann, Gesamtb. Kakteen 241. 1897) are given by Schumann as synonyms of this species, but neither was published and the latter was not cited at the place mentioned by Schumann. It has been briefly described as a variety and will be found in the synonymy above as *stylodes*. *E. campylacantha* with its two forms *longispina* and *brevispina* are assigned to R. Meyer (Monatsschr. Kakteenk. 5: 36. 1895), who as a matter of fact published only the names *Echinopsis poselgeri* var. *brevispina* and var. *longispina*.

Echinopsis leucantha aurea (Monatsschr. Kakteenk. 17: 76. 1907), *E. salpingophora aurea* (Monatsschr. Kakteenk. 12: 63. 1902) and *E. leucantha salpingophora* Schumann (Monatsschr. Kakteenk. 13: 62. 1903) are not described at the places cited above. *Melocactus elegans* Pfeiffer (Allg. Gartenz. 3: 244. 1835) is usually referred here.

Echinopsis melanopotamica which comes from southern Argentina we have referred here; if it belong here it represents the southern form of the species. We have not seen the type but we have seen fruits collected by Fischer and spines by Alex Wetmore (1920), both from the Rio Negro region, presumably referable here. They suggest the desirability of further field study.

Illustrations: Edwards's Bot. Reg. 26: pl. 13, as *Cereus leucanthus;* Curtis's Bot. Mag. 77: pl. 4567; Fl. Serr. 6: pl. 635; Jard. Fleur. 1: pl. 98; Loudon, Encycl. Pl. ed. 3. 1378. f. 19385; Rümpler, Sukkulenten f. 95; Möllers Deutsche Gärt. Zeit. 25: 475. f. 7, No. 15, as *Echinopsis campylacantha;* Monatsschr. Kakteenk. 5: 35; Kirtcht, Kakteen Zimmergarten 23, as *Echinopsis salpingophora;* Möllers Deutsche Gärt. Zeit. 25: 475. f. 7, No. 7,

*The original spelling of this name was *salpigophora*, but Schumann says that it should be *salpingophora*.

as *Echinopsis salpingophora aurea;* Möllers Deutsche Gärt. Zeit. **25**: 475. f. 7, No. 21, as *Echinopsis leucantha aurea*; Addisonia **4**: pl. 147.

Plate VII, figure 2, shows a flowering plant brought from Mendoza to the New York Botanical Garden by Dr. Rose in 1915.

21. Echinopsis obrepanda (Salm-Dyck) Schumann in Engler and Prantl, Pflanzenfam. 3^{6a}: 184. 1894

Echinocactus obrepandus Salm-Dyck, Allg. Gartenz. **13**: 386. 1845.
Echinocactus misleyi Cels, Portef. Hort. 216. 1847.
Echinopsis cristata Salm-Dyck, Cact. Hort. Dyck. 1849. 178. 1850.
Echinopsis cristata purpurea Labouret in Curtis's Bot. Mag. **76**: pl. 4521. 1850.
Echinopsis misleyi Labouret, Monogr. Cact. 291. 1853.

Plant globose or somewhat depressed, 15 to 20 cm. in diameter; ribs 17 or 18, rather prominent, thin, strongly undulate, pale bluish green; areoles somewhat immersed in the rib; spines rigid, brownish; radial spines 10, spreading, or somewhat recurved, 12 to 16 mm. long; central spine solitary, 25 mm. long, ascending, curved; flowers lateral, white or purplish, the tube 20 cm. long, green; scales on ovary and flower-tube acuminate, bearing an abundance of black hairs in their axils; inner perianth-segments large, serrate, mucronate.

FIG. 92.—Echinopsis obrepanda.

Type locality: Bolivia.
Distribution: Bolivia.

This plant was collected by Mr. Thomas Bridges in Bolivia in 1844 and first described by Salm-Dyck in 1845 as *Echinocactus obrepandus*, but when in 1850 he transferred it to *Echinopsis* he changed the specific name to *cristata*. A part of Bridges's material went to Kew; one of the specimens produced purple flowers, and another nearly white flowers; there is a possibility that more than one species was collected by Bridges at this time. The figures given in Gartenflora (**38**: f. 47) and Monatsschrift für Kakteenkunde (**12**: 169) are not quite typical. Here Weber refers *Echinopsis obliqua* Cels (Dict. Hort. Bois 472. 1896).

The plant is known to us only from descriptions and illustrations.

Illustrations: Curtis's Bot. Mag. **78**: pl. 4687; Gartenflora **38**: f. 47; Jard. Fleur. **1**: pl. 73, 74; Loudon, Encycl. Pl. ed. 3. 1378. f. 19386; Cassell's Dict. Gard. **1**: 315, as *Echinopsis cristata;* Curtis's Bot. Mag. **76**: pl. 4521, as *Echinopsis cristata purpurea;* Möllers Deutsche Gärt. Zeit. **25**: 475. f. 7, No. 5; Monatsschr. Kakteenk. **12**: 169; Gartenwelt **16**: pl. opp. 106; 107.

Figure 92 is copied from the first illustration above cited.

22. Echinopsis intricatissima Spegazzini, Anal. Mus. Nac. Buenos Aires III. **4**: 491. 1905.

Simple, somewhat ovoid, 20 cm. high, not depressed at apex; ribs 16; spines at first rose-colored, in age gray, elongated, 3 to 6 cm. long, the lowest ones 8 to 10 cm. long; radial spines 8 to 13; central spines 4 to 6, curved upward; flowers 20 to 22 cm. long; inner perianth-segments lanceolate, white; fruit 3 cm. long.

Type locality: Near Mendoza, Argentina.
Distribution: Known only from the type locality.

23. Echinopsis molesta Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 490. 1905.

Plants simple, subglobose, 20 cm. in diameter, pale green, not shining; ribs 13, prominent, acute on edge and somewhat undulate; areoles large; spines all grayish, rather stout; radial spines 6 to 8, straight, 10 to 15 mm. long; central spines 4, bulbose at base, slightly incurved, the lower one the longest, 3 cm. long; flowers slightly odorous, large, 22 to 24 cm. long; inner perianth-segments lanceolate, white; stamens, style and stigma-lobes white.

Type locality: Province of Córdoba, Argentina.
Distribution: Córdoba, Argentina.
This species is known to us only from description.

24. Echinopsis baldiana Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 490. 1905.

Stems simple, cylindric, 2 to 3 dm. high, 12 to 15 cm. in diameter; ribs 13 or 14, not all crenate; areoles large; spines slender, blackish brown; radial spines 9 to 11, 15 mm. long; central spines 3 or 4, 3 to 5 cm. long; flowers odorous, very large; inner perianth-segments lanceolate, acute, white; fruit large, 4 to 5 cm. long.

Type locality: Near Ancasti, province of Catamarca, Argentina.
Distribution: The dry mountain regions of the province of Catamarca, Argentina.
This species is known to us only from description.

25. Echinopsis aurea sp. nov.

Plants solitary, small, globular to short-cylindric, 5 to 10 cm. high; ribs 14 or 15, acute on the edge, separated by deep intervals; areoles when young filled with short brown wool; radial spines about 10, 1 cm. long; central spines usually 4, much stouter than the radials, often flattened, 2 to 3 cm. long: flowers from the side of the plant; flower-tube slightly curved, funnelform, greenish white, its scales ovate-linear, 4 to 6 mm. long, pale green but reddish at base, their axils filled with black and white hairs; flower-bud 9 cm. long, when young covered with long silky hairs; expanded flower 8 cm. broad, the perianth-segments in about 3 series, lemon-yellow, the inner ones deeper colored, about 20. oblong, mucronately tipped; filaments in 2 series, the upper series attached at the top of the throat, stiff and erect, exserted; the lower series inserted near the base of the throat, included; style green, very short and included, only 3 cm. long; stigma-lobes linear, cream-colored; scales on ovary small. their axils filled with long hairs; fruit not known.

Collected by Dr. Rose near Cassafousth, Córdoba, Argentina, in 1915 (No. 21046) and flowered in the New York Botanical Garden, May 6, 1916.

Plate X, figure 1, shows the plant in flower.

26. Echinopsis bridgesii Salm-Dyck, Cact. Hort. Dyck. 1849. 181. 1850.

Echinocactus salmianus Cels, Protef. Hort. 180. 1847. Not Link and Otto, 1827.
Echinopsis salmiana Weber, Dict. Hort. Bois 472. 1896.
Cereus salmianus Cels in Weber, Dict. Hort. Bois 472. 1896, as synonym.
Echinopsis salmiana bridgesii Schumann, Gesamtb. Kakteen 237. 1897.

Plants usually in clumps of 3 to 6, low, 1 dm. in diameter or more; ribs 10 to 12, high, not undulate; areoles large, filled with spines and short brown wool; spines about 10, brown when young, unequal; flowers 15 to 18 cm. long, probably white; tube slender, about the length of the limb; inner perianth-segments 3 to 4 cm. long, acute; scales on the ovary and flower-tube filled with long gray and black hairs.

Type locality: Bolivia.
Distribution: Bolivia.
The species was originally described from barren specimens. We believe that we have its flowers in the specimens collected by Mr. Bang. Plants were collected by Miguel Bang near La Paz, Bolivia, in 1890 (No. 176) and at the same locality by J. N. Rose, August 11, 1914 (No. 18844), also by Mr. Bang near Cochibamba, Bolivia, in 1901 (No. 2051). Dr. Rose's plant was without flower and its reference here is only tentative, but the habit of the plant was clearly that of the cespitose species of *Echinopsis*. Schumann, who studied Bang's plant, compared it with *Cereus pasacana* (see Cactaceae

2: 133. 1920) from which it is very distinct although the flowers resemble very much those of a *Trichocereus*.

27. **Echinopsis mamillosa** Gürke, Monatsschr. Kakteenk. 17: 128. 1907.

Stem simple, depressed-globose, 6 cm. high, 8 cm. in diameter, shining dark green, tubercled and unarmed at the apex; ribs 17, divided by deep furrows into acute tubercles; areoles 8 to 12 mm. apart, irregularly orbicular; radial spines 8 to 10, subulate, 5 to 10 mm. long; central spines 1 to 4, somewhat stronger and longer than the radials, all yellowish, brown at the apex; flowers 15 to 18 cm. long, white, rose-colored towards the apex of the segments; flower-tube funnelform, somewhat curved, green, bearing small ovate scales, these hairy in their axils; outer perianth-segments linear, brownish, spreading; inner perianth-segments oblong, apiculate; stigma-lobes yellow, linear, about 10.

Type locality: Bolivia.

Distribution: Bolivia.

We have not seen this plant, but have a colored sketch of the type made by Mrs. Gürke, July 16, 1907. Through some error, the Kew Bulletin (Kew Bull. Misc. Inf. App. 87. 1908) describes the flower as only three-fourths of an inch in length.

Although this species is formally described on page 135 of the Monatsschrift für Kakteenkunde, it is technically described a month earlier (p. 128). In fact, the flowers are much better and more fully characterized here than in the formal description.

Illustration: Monatsschr. Kakteenk. 31: 153.

28. **Echinopsis formosa** (Pfeiffer) Jacobi in Salm-Dyck, Cact. Hort. Dyck. 1849. 39. 1850.

Echinocactus formosus Pfeiffer, Enum. Cact. 50. 1837.
Echinopsis formosa spinosior Salm-Dyck in Labouret, Monogr. Cact. 303. 1853.
Echinopsis formosa laevior Monville in Labouret, Monogr. Cact. 303. 1853.
Echinopsis formosa rubrispina Monville in Labouret, Monogr. Cact. 303. 1853.

Simple, oblong, 3 dm. high, pale green; ribs 15 to 35, vertical; areoles 8 to 10 mm. apart; spines acicular, reddish, 2 to 4 cm. long; radial spines 8 to 16, yellowish; central spines 2 to 4, brown; flowers golden-yellow, 8 cm. long, 8 cm. broad.

Type locality: Mendoza, Argentina.

Distribution: Western Argentina.

We know the species only from descriptions and from some very poor illustrations. H. J. Elwes (Gard. Chron. III. 70: 199. 1921) states that there is a specimen in the Darrah Collection at Manchester that is 2 feet high. It has added but one inch to its height in the last 10 years. The specimen has been in England for 60 years.

Cereus gilliesii Weber (Dict. Hort. Bois 471. 1896) was given as a synonym of *Echinopsis formosa*.

Melocactus gilliesii (Otto, Allg. Gartenz. 1: 364. 1833) and *Echinocactus gilliesii* and *Echinopsis formosa gilliesii* (Salm-Dyck, Cact. Hort. Dyck. 1844. 22. 1845) are usually referred to *Echinopsis formosa*.

Echinocactus formosus crassispinus Monville (Labouret, Monogr. Cact. 303. 1853) was published as a synonym of *Echinopsis formosa spinosior* and therefore doubtless belongs here.

Echinopsis formosa albispina Weber is mentioned by Schelle (Handb. Kakteenk. 118. 1907).

Illustrations: Schelle, Handb. Kakteenk. f. 51; Monatsschr. Kakteenk. 4: 187. f. 1; Knippel, Kakteen pl. 16.

UNCERTAIN OR UNDESCRIBED SPECIES.

ECHINOPSIS MIECKLEYI R. Meyer, Monatsschr. Kakteenk. 28: 122. 1918.

Simple, ellipsoid to short-columnar, pale grayish green, 16 cm. high, 10 cm. in diameter; ribs 14, high, somewhat sinuous; radial spines usually 10, but sometimes 9 or 11, straight, 2.5 cm. long; central spine solitary, stouter than the radials, pale brown, sometimes whitish at tips, 5 cm. long; flowers and fruit unknown.

ECHINOPSIS GIGANTEA R. Meyer, Monatsschr. Kakteenk. **29**: 58. 1919.

Simple, ellipsoid to columnar, pale grayish green; ribs 8 to 11, high, broad at base, somewhat sinuous; radial spines 5 to 10; central spines sometimes 2, but usually solitary; flowers unknown.

ECHINOPSIS SALUCIANA Schlumberger, Rev. Hort. IV. **5**: 402. 1856.

"Tube 15 to 16 cm. high, green, and covered with scales bearing tufts of brown hairs; sepals very numerous, lanceolate, 9 cm. long and 8 mm. wide at the base, dirty white with a central green stripe; petals 2 cm. wide and 6 cm. long, pure white; stamens yellowish; style short; stigma not projecting from the tube and having 12 yellowish-white stigma-lobes. The flower lasts but one day.

"With its large narrow sepals (?) and wide petals, the flower resembles very much more the flower of a *Cereus* than that of an *Echinopsis*."

A free translation of the original description is given above.

ECHINOPSIS DUCIS PAULII Förster, Handb. Cact. ed. 2. 641. 1885.

Simple, columnar, 6 to 7 cm. in diameter; ribs 18 to 21; radial spines 6 to 8, 2 cm. long; central spines 2 to 4; flowers and fruit unknown.

It is known only as a cultivated plant.

ECHINOPSIS TACUAREMBENSE Arechavaleta, Anal. Mus. Nac. Montevideo **5**: 254. 1905.

Dull green, 10 cm. high, about 15 cm. in diameter; ribs 13, vertical; areoles 1 cm. apart; spines 9 or 10, 1 to 1.5 cm. long; central spine solitary; flowers white.

Type locality: Not cited.
Distribution: Uruguay.

ECHINOPSIS ALBISPINA (Monatsschr. Kakteenk. **13**: 144. 1903) is described as a white-spined, very interesting form.

ECHINOPSIS BECKMANNII (Monatsschr. Kakteenk. **3**: 103. 1893) and E. BOECKMANNII (Monatsschr. Kakteenk. 3: 165. 1893) are only names and have never been referred to any described species.

ECHINOPSIS BOUTILLIERI Parmentier (Förster, Handb. Cact. ed. 2. 622. 1885) is only a name.

ECHINOPSIS DUVALLII (Monatsschr. Kakteenk 1: 54. 1891) is from a seedling of unknown origin with pale rose flowers.

ECHINOPSIS FOBEANA (Monatsschr. Kakteenk. **20**: 190. 1910) is without description. A poor illustration is published by Möllers (Deutche Gärt. Zeit. **25**: 475. f. 7, No. 20).

ECHINOPSIS FORMOSISSIMA Labouret (Rev. Hort. IV. **4**: 26. 1855) probably does not belong to this genus. It originally came from Chuquisaca, Bolivia, although it is credited to Mexico by the Index Kewensis. Schumann refers it to *Cereus pasacana* Weber. Two illustrations of barren juvenile plants have been published (Möllers Deutsche Gärt. Zeit. 25: 475. f. 7, No. 9 and Monatsschr. Kakteenk. **4**: 187. f. 2).

ECHINOPSIS LONGISPINA (Monatsschr. Kakteenk. **3**: 127. 1893) is only a name.

ECHINOPSIS MUELLERI (Monatsschr. Kakteenk. **6**: 144. 1896) is a well-known garden form, presumably a hybrid. It is described in some detail in the Cactus Journal and illustrated (2: 7).

ECHINOPSIS NIGRICANS Linke (Allg. Gartenz. **25**: 239. 1857) is said to come from Chile. If so, it probably does not belong to this genus.

ECHINOPSIS PARAGUAYENSIS Mundt (Monatsschr. Kakteenk. **13**: 109. 1903) is briefly mentioned.

ECHINOPSIS POLYPHYLLA (Monatsschr. Kakteenk. **19**: 144. 1909) is perhaps a hybrid.

ECHINOPSIS PYRANTHA (Monatsschr. Kakteenk. **4**: 97. 1894) has not been described but has been said to be the most beautiful species of the genus.

ECHINOPSIS QUEHLII (Monatsschr. Kakteenk. 1: 55. 1891) is said to have been grown from Mexican seed. It is said to have beautiful pale rose flowers. If native to Mexico it must be referable to some other genus. Schelle lists it with the hybrids of *E. eyriesii* and *E. oxygona*.

ECHINOPSIS SALM-DYCKIANA (Monatsschr. Kakteenk. **20**: 142. 1910) is only a name.

ECHINOPSIS TOUGARDII L. Herincq (Hort. Franc. **3**: 193. pl. 17. 1853) is, according to Schuman, only a hybrid. It has very beautiful flowers.

ECHINOPSIS TUBERCULATA Niedt (Allg. Gartenz. **25**: 237. 1857), said to come from Bolivia, we do not know.

ECHINOPSIS UNDULATA (Monatsschr. Kakteenk. **11**: 61. 1901) is briefly described as yellow-flowered and is probably a hybrid.

The three following names, although sometimes referred to *Echinopsis*, were evidently intended as species of *Echinocactus*. In all of them the generic name is abbreviated to "*Ech.*" and, as they follow a species of *Echinopsis*. this abbreviation has naturally been taken to refer to that name. In each case, however, the species are referred to definite sections of *Echinocactus* as outlined by Salm-Dyck. Then, too, the gender of the specific name agrees with *Echinocactus* and not with *Echinopsis*. The three names are referred to *Echinopsis* by the Index Kewensis:

Ech. nodosus Linke, Wochenschr. Gärtn. Pflanz. 1:85. 1858.
Ech. setosus Linke, Wochenschr. Gärtn. Pflanz. 1:86. 1858.
Ech. haageanus Linke, Wochenschr. Gärtn. Pflanz. 1:86. 1858.

The first two have been taken up formally in *Echinocactus* by Hemsley (Biol. Centr. Amer. Bot. 1: 535, 537. 1880) and the third by Rümpler (Förster, Handb. Cact. ed. 2. 469. 1885).

Echinopsis fischeri tephracantha and *E. nigerrima* are in the trade.

Subtribe 4. ECHINOCACTANAE.

Plants usually low and small, but sometimes several meters tall and then of considerable size, simple or cespitose, terrestrial; stems normally one-jointed but sometimes budding or cespitose or making other joints when injured; ribs few to many, straight or spiral, usually spine-bearing; flowers always solitary at areoles near the apex of the plant, usually from the nascent areoles; fruit more or less scaly or naked, usually dry, in some cases a little fleshy and then somewhat edible, usually dehiscing by a basal pore, but sometimes irregularly breaking apart, or by a circumscissile opening; seeds black or sometimes brown, smooth or papillose.

We recognize 28 genera, most of which are taken from *Echinocactus* as circumscribed by previous authors.

The subtribe passes into the *Echinocereanae* on the one hand and into the *Coryphanthanae* on the other.

In most of the genera of this subtribe, as well as in a few other genera, such as *Oreocereus*, the seeds escape through a pore at the base of the fruit. If the fruit be gathered before it fully ripens, this pore will not be shown, but, as the fruit ripens, the basal part which is attached to the plant becomes absorbed and disappears and, when the fruit finally falls off, the large opening, sometimes 5 to 7 cm. in diameter, can be seen. In most of the genera the fruit becomes hollow and the seeds are attached on the inner surface until fully ripe, when they fall to the bottom and make their escape. In *Homalocephala texensis* the fruit bursts irregularly, while in *Mila* and a few other genera the fruit is a small juicy berry.

KEY TO GENERA.

A. Flower-tube bent; stamens long-exserted ..... 1. *Denmoza* (p. 78)
AA. Flower-tube straight, usually with a broad throat; stamens included.
  B. Ovary and fruit naked. (See *Copiapoa*.)
    Plants spineless, except seedlings.
      Tubercles prominent, cartilaginous, flattened, more or less imbricated . 2. *Ariocarpus* (p. 80)
      Tubercles low, rounded above ..... 3. *Lophophora* (p. 83)
    Plants very spiny.
      Fruit crowned by sepal-like scales ..... 4. *Copiapoa* (85)
      Fruit naked at top.
        Fruit dry.
          Spines acicular ..... 5. *Pediocactus* (p. 90)
          Spines flat, papery ..... 6. *Toumeya* (p. 91)
        Fruit fleshy, indehiscent ..... 7. *Epithelantha* (p. 92)
  BB. Ovary and fruit scaly.
    C. Flowers funnelform, often with a slender tube.
      Axils of flower-scales hairy or bristly.
        Axils of flower-scales with bristles and hairs ..... 8. *Neoporteria* (p. 94)
        Axils of flower-scales with hairs only.
          Flowers long-funnelform ..... 9. *Arequipa* (p. 100)
          Flowers short-funnelform ..... 10. *Oroya* (p. 102)

KEY TO GENERA—continued.

Axils of flower-scales naked.
Tube of flower longer than limb, its scales not fimbriate; spines all straight ..... 11. *Matucana* (p. 102)
Tube of flower not longer than limb, its scales fimbriate; central spine hooked ..... 12. *Hamatocactus* (p. 104)
CC. Flowers mostly campanulate, at least not long and slender. (See *Leuchtenbergia* and some species of *Gymnocalycium*).
D. Areoles not arranged on ribs.
Tubercles short, imbricated, much as in *Ariocarpus* ..... 13. *Strombocactus* (p. 106)
Tubercles much elongated, slender, finger-like ..... 14. *Leuchtenbergia* (p. 107)
DD. Areoles arranged on definite ribs.
E. Scales of ovary and perianth-tube entire (except in some large species of *Ferocactus*).
F. Axils of scales on ovary and fruit naked.
Ribs usually continuous, rarely if ever tubercled; flowers with scarcely any tube.
Ribs usually numerous, much compressed and thin ... 15. *Echinofossulocactus* (p. 109)
Ribs not so numerous, usually thick ..... 16. *Ferocactus* (p. 123)
Ribs usually broad, tubercled; flowers with a short but definite tube.
Spines or most of them acicular; flowers purple; seeds muricate ..... 17. *Echinomastus* (p. 147)
Spines stout, mostly subulate; flowers white, yellow, or pink; seeds tuberculate ..... 18. *Gymnocalycium* (p. 152)
FF. Axils of scales on ovary hairy, woolly or setose.
Ovary-scales many, their axils woolly.
Axils of scales on flower-tube neither bristly nor spiny.
Ribs several to many; plants very spiny.
Fruit permanently woolly, nearly dry, dehiscent by a terminal pore ..... 19. *Echinocactus* (p. 166)
Fruit not so woolly, bursting irregularly, somewhat fleshy ..... 20. *Homalocephala* (p. 181)
Ribs few, broad; plants mostly spineless ..... 21. *Astrophytum* (p. 182)
Axils of scales on flower-tube usually bristly or spiny as well as woolly.
Top of fruit spinose; seeds pitted ..... 22. *Eriosyce* (p. 186)
Top of fruit not spinose; seeds not pitted.
Seeds not shell-like; plants mostly large.
Spines straight or rarely curved; seeds with truncate base ..... 23. *Malacocarpus* (p. 187)
Spines acicular, one of centrals strongly hooked; seeds minute ..... 24. *Hickenia* (p. 207)
Seeds shell-like; plants very small ..... 25. *Frailea* (p. 208)
Ovary-scales few, their axils with tufts of short hairs.
Fruit a berry; spines all straight ..... 26. *Mila* (p. 211)
Fruit dry, dehiscent by a basal pore; some spines hooked. 27. *Sclerocactus* (p. 212)
EE. Scales of ovary and perianth-tube fimbriate-lacerate; plant small; flowers nearly rotate ..... 28. *Utahia* (p. 215)

1. DENMOZA gen. nov.

Plant cylindric, often elongated, the numerous, parallel straight ribs slightly undulate; spines in clusters at the areoles; flowers arising from the top of the plant, zygomorphic, scarlet, with a slender throat and very narrow limb; tube proper very short, its mouth closed with a mass of white wool; inner surface of the elongated throat covered with stamens; filaments and style long-exserted; ovary and tube bearing numerous scales, their axils filled with silky hairs; fruit globular, dry, splitting down from the top; seeds black, dull, pitted.

Type species: *Echinocactus rhodacanthus* Salm-Dyck.

The generic name is an anagram of Mendoza, the province in Argentina, where the plant is native. Only one species is known.

The peculiar mass of white wool near the base of the flower-tube on the inside is not known, as far as our observation goes, in any other cactus, except in two species of *Lobivia* of doubtful relationship, described by Dr. Spegazzini as species of *Echinocactus*, and in *E. spiniflorus*, all of which are otherwise quite different from *Denmoza*.

The genus here segregated was considered by Schumann as a species of *Echinopsis* but it has also been referred to *Cereus*, *Echinocactus*, *Cleistocactus*, and *Pilocereus*. In its

M. E. Eaton del.

1. Top of flowering plant of *Pediocactus simpsonii*.
2. Flower of *Denmoza rhodacantha*.
3. Flowering plant of *Ariocarpus kotschoubeyanus*.
4. Top of flowering plant of *Neoporteria subgibbosa*.

(All natural size.)

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rather narrow flowers and exserted stamens there are suggestions of *Cleistocactus*, but the plant body is very different. It is more like some species of *Echinopsis*, to which, however, its flowers show little resemblance. It has no close relationship to *Cereus* or *Cephalocereus*.

Denmoza differs from all other genera in this subtribe in producing long bristle-like spines from the flowering areoles of very old plants.

1. Denmoza rhodacantha (Salm-Dyck).

Echinocactus rhodacanthus Salm-Dyck, Hort. Dyck. 341. 1834.
Echinopsis rhodacantha Salm-Dyck, Cact. Hort. Dyck. 1849. 39. 1850.
Cleistocactus rhodacanthus Lemaire, Illustr. Hort. 8: Misc. 35. 1861.
Pilocereus erythrocephalus Schumann, Gesamtb. Kakteen 195. 1897.
Cereus erythrocephalus Berger, Rep. Mo. Bot. Gard. 16: 69. 1905.
Pilocereus rhodacanthus Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 485. 1905.

Simple, at first globular, often 3 to 6 dm. long, but becoming elongated, and when of great age 1.5 meters high and 3 dm. in diameter; ribs 15 to 20 or even 30, broad at base, separated by narrow intervals, about 1 cm. high; young areoles felted, circular, when old 8 to 10 mm. in diameter, usually 1 to 2 cm. apart, but on very old plants approximate, perhaps confluent; spines very different on young and very old plants; spines on small plants 6 to 12 at each areole, white or reddish, subulate, more or less curved, 4 cm. long or less; central spine, if present, solitary; spines on the top of old plants slender and longer, 7 cm. long, often accompanied by a row of 10 or more long brown bristles; flowers slender, 4 to 5 cm. long; ovary and flower-tube bearing small, triangular to lanceolate, appressed, acute scales with long white hairs in their axils; perianth-segments small, apparently connivent; filaments red, exserted for at least 1 cm. beyond the tube; style red, exserted; wool at base of throat matted, 6 to 8 mm. long; fruit 2 cm. in diameter, nearly smooth in age; seeds oblique, 1.5 mm. in diameter.

FIG. 93.—Denmoza rhodacantha.

Type locality: Not cited at place of publication, but doubtless Mendoza, Argentina.

Distribution: Western mountains of Argentina.

Vaupel (Monatsschr. Kakteenk. 31: 13. 1921) gives an interesting description of the species which flowered in Berlin in 1920 where it is grown as *Cereus erythrocephalus*.

Pfeiffer gives *Echinocactus coccineus* (Enum. Cact. 50. 1837) as a synonym, while Weber gives *Cereus rhodacanthus* Weber (Dict. Hort. Bois 472. 1896) as a synonym, but neither is described. It is not at all unlikely that *Mammillaria coccinea* G. Don (Loudon, Hort. Brit. 194. 1830; *Cactus coccineus* Gillies), said to have come from Chile, is also to be referred here.

Schumann refers here *Echinopsis aurata* Salm-Dyck and *Echinocactus dumesnilianus* Cels but these references are very doubtful; they probably belong to *Eriosyce ceratistes*.

The following varieties have been referred to this species: *Echinocactus rhodacanthus coccineus* Monville (Labouret, Monogr. Cact. 304. 1853), *Echinopsis rhodacantha aurea* (Monatsschr. Kakteenk. 17: 76. 1907) and *Echinopsis rhodacantha gracilior* Labouret (Monogr. Cact. 304. 1853).

Illustrations: Blühende Kakteen 1: pl. 16; Monatsschr. Kakteenk. 4: 187. f. 3; Möllers Deutsche Gärt. Zeit. 25: 481. f. 12, as *Echinopsis rhodacantha*.

Plate VIII, figure 2, shows a flower of a plant brought by Dr. Rose to the New York Botanical Garden in 1915, which bloomed in 1917. Figure 93 is from a photograph taken by Paul G. Russell at Mendoza, Argentina, in 1915.

2. **ARIOCARPUS** Scheidweiler, Bull. Acad. Sci. Brux. 5: 491. 1838.

Anhalonium Lemaire, Cact. Gen. Nov. Sp. 1. 1839.

Plants spineless,* usually simple, low, with a flat or round top; tubercles tough, horny, or cartilaginous, triangular, imbricated, spirally arranged, the lower part tapering into a claw, the upper or blade-like part expanded; areoles terminal or at the bottom of a triangular groove near the middle of tubercle, filled with hair when young; flowers appearing from near the center on young tubercles, diurnal, rotate-campanulate, white to purple; fruit oblong, smooth; seeds black, tuberculately roughened, with a large basal hilum; embryo described as obovate, straight.

Type species: *Ariocarpus retusus* Scheidweiler.

This genus long passed under the name of *Anhalonium*, but it was found that *Ariocarpus* had priority and hence was taken up. Karwinsky proposed the name *Stromatocactus* for one of the species, but no description of it was ever published. The genus is usually considered as most closely related to *Mammillaria*, under which genus two of the species have been placed. Engelmann, who was greatly puzzled over the group, first considered it the same as *Mammillaria*, then as a subgenus of *Mammillaria*, and later as a distinct genus.

In its small, oblong, naked fruit and straight embryo, it suggests a *Mammillaria*, but in its tubercles, areoles, seeds, and absence of spines, it is very unlike any of the species of that genus.

The generic name is from the genus *Aria* and καρπός fruit, referring to the Aria-like fruit. We recognize three species, natives of southern Texas and northern Mexico.

KEY TO SPECIES.

Tubercles not grooved on upper side.....1. *A. retusus*
Tubercles grooved on upper side.
  Plants small, 3 to 5 cm. broad.....2. *A. kotschoubeyanus*
  Plants large, 10 to 15 cm. broad.....3. *A. fissuratus*

1. **Ariocarpus retusus** Scheidweiler, Bull. Acad. Sci. Brux. 5: 492. 1838.

Anhalonium prismaticum Lemaire, Cact. Gen. Nov. Sp. 1. 1839.
Anhalonium retusum Salm-Dyck, Cact. Hort. Dyck. 1844. 15. 1845.
Anhalonium elongatum Salm-Dyck, Cact. Hort. Dyck. 1849. 77. 1850.
Anhalonium areolosum Lemaire, Illustr. Hort. 6: Misc. 35. 1859.
Anhalonium pulvilligerum Lemaire, Illustr. Hort. 16: Misc. 72. 1869.†
Mammillaria areolosa Hemsley, Biol. Centr. Amer. Bot. 1: 503. 1880.
Mammillaria elongata Hemsley, Biol. Centr. Amer. Bot. 1: 509. 1880. Not De Candolle, 1828.
Mammillaria prismatica Hemsley, Biol. Centr. Amer. Bot. 1: 519. 1880.
Mammillaria furfuracea‡ S. Watson, Proc. Amer. Acad. 25: 150. 1890.
Cactus prismaticus Kuntze, Rev. Gen. Pl. 1: 261. 1891.
Anhalonium trigonum Weber, Dict. Hort. Bois 90. 1893.
Anhalonium furfuraceum Coulter, Contr. U. S. Nat. Herb. 3: 130. 1894.
Ariocarpus pulvilligerus Schumann, Bot. Jahrb. Engler 24: 550. 1898.
Ariocarpus furfuraceus Thompson, Rep. Mo. Bot. Gard. 9: 130. 1898.
Ariocarpus trigonus Schumann, Gesamtb. Kakteen 606. 1898.
Ariocarpus prismaticus Cobbold, Journ. Hort. Home Farm. III. 46: 332. 1903.

Plants globular or more or less depressed, usually 10 to 12 cm. broad, grayish green to purplish, very woolly at the center; tubercles horny, imbricated, 5 cm. long or less, ovate, more or less 3-angled, acute to acuminate, often with a woolly areole on the upper side near the tip and this sometimes spinescent; flowers borne at the axils of young tubercles near the center, white or nearly so, up to 6 cm. long; outer perianth-segments pinkish, narrow, acute to acuminate; inner perianth-segments at first white, afterwards pinkish, narrowly oblanceolate, with a mucronate tip; stamens numerous, erect; style white; stigma-lobes 9, linear, white; fruit oblong, white, naked; seeds globular, 1.5 mm. in diameter, black, tuberculate-roughened.

*Sometimes in *Ariocarpus retusus* small spines are produced in the areoles near the tip of the tubercles.

†Lemaire gives for this species a reference (Herb. Génér. Amat. Nouvel Sér. Misc. 45) which we have not been able to locate. Coulter (Contr. U. S. Nat. Herb. 3: 130. 1894) refers this name to Lemaire "Cact. 1839." the Index Kewensis to "Hort. Monv. 1: 275," and Labouret to "Hort. Univ. 1: 275, figure," but we have not been able to confirm them. If this name were published in 1839, it would transfer the publication of *Anhalonium elongatum* Salm-Dyck back to 1845 (Cact. Hort. Dyck. 1844. 15).

‡Reported in the Index Kewensis (Suppl. 1. 263. 1906) as *Mammillaria purpuracea*.

Type locality: San Luis Potosí, Mexico.

Distribution: States of Coahuila, Zacatecas, and San Luis Potosí, Mexico.

This species, as here described, is extremely variable in the shape, size, color, and markings of the tubercles, and in the presence or absence of woolly areoles near the tips of the tubercles. Several species have been described from these various forms, but there seems to be no good ground for such a course. The plant is called chaute by the Mexicans.

The plant usually grows in the open in rocky places where it is nearly covered with broken stones and only its long tubercles are visible.

Mammillaria retusa Mittler (Handb. Liebh. 11) is referred here by Schumann, but we have not seen this reference.

Mammillaria aloides Monville (Cat. 1846) is referred by Labouret as a synonym of *Anhalonium prismaticum*, by Schumann as a synonym of *Ariocarpus retusus*, and by the Index Kewensis as a synonym of *Mammillaria prismatica*. *Anhalonium aloides pulvilligerum* Monville we know only from Lemaire (Illustr. Hort. **16**: Misc. 72. 1869) who gives it

FIG. 94.—Ariocarpus retusus.

FIG. 95.—Ariocarpus fissuratus.

as a synonym of *A. pulvilligerum*. *Mammillaria pulvilligera* Monville (Förster, Handb. Cact. ed. 2. 231. 1885) is given by Rümpler as a synonym of *Anhalonium elongatum*. *Mammillaria aloidaea pulviligera* which appeared in Monville's Catalogue of 1846 is referred by Labouret to *Anhalonium elongatum*. To *Mammillaria trigona* is referred *Ariocarpus trigonus* by the Index Kewensis (Suppl. 2. 16. 1904).

Illustrations: Möllers Deutsche Gärt. Zeit. **29**: 76. f. 5, 6; 77. f. 7, 8, as *Ariocarpus trigonus;* Gartenwelt **15**: 538, as *Anhalonium trigonum;* Gartenwelt **15**: 538; Cact. Journ. **2**: 109; Hort. Univ. **1**: pl. 30; Balt. Cact. Journ. **2**: 266. f. 1; Herb. Génér. Amat. II. **2**: pl. 16; Arch. Exper. Path. **34**: pl. 1, f. 2; Journ. Amer. Chem. Soc. **18**: f. 5; Palmer, Cult. Cact. 123; Garten-Zeitung **4**: 541. f. 126; 182. f. 42, No. 16, as *Anhalonium prismaticum;* Curtis's Bot. Mag. **119**: pl. 7279, as *Mammillaria prismatica;* Cact. Journ. **1**: pl. for November; Rep. Mo. Bot. Gard. **9**: pl. 34; Ann. Rep. Smiths. Inst. **1908**: pl. 15, f. 2, as *Ariocarpus furfuraceus;* Möllers Deutsche Gärt. Zeit. 25: 477. f. 11, No. 7; Blühende Kakteen **1**: pl. 48; Ann. Rep. Smiths. Inst. **1908**: pl. 15, f. 1; Bull. Acad. Sci. Brux. **5**: pl. 1; Rep. Mo. Bot. Gard. **9**: pl. 35; Cact. Journ. **1**: pl. for September and November; Schelle, Handb. Kakteenk. f. 199; Hort. Belge **5**: pl. 21, 22.

Plate IX, figure 2, is from a photograph of a plant sent Dr. Edward Palmer from San Luis Potosí, Mexico, in 1905, which afterwards flowered in Washington. Figure 94 is from a photograph of a plant sent by Professor Lloyd from Zacatecas in 1908.

2. Ariocarpus kotschoubeyanus (Lemaire) Schumann in Engler and Prantl, Pflanzenfam. Nachtr. 259. 1897.

Anhalonium kotschoubeyanum Lemaire, Bull. Cercle Confér. Hort. Dép. Seine. 1842.
Anhalonium sulcatum Salm-Dyck, Cact. Hort. Dyck. 1849. 5. 1850.
*Cactus kotschubeyi** Kuntze, Rev. Gen. Pl. 1: 260. 1891.
Ariocarpus sulcatus Schumann, Monatsschr. Kakteenk. 7: 9. 1897.

Plants grayish green, 3 to 5 cm. broad, only the flat crown appearing above the surface of the ground, with a thickened, fleshy rootstock, and with several spindle-shaped roots from the base; upper part of tubercle flattened, triangular, 6 to 8 mm. long, grooved along its middle, almost to the tip, the groove very woolly; flowers 2.5 to 3 cm. long, originating in the center of the plant from the axils of the young tubercles, surrounded by a cluster of hairs; outer perianth-segments few, brownish, obtuse; inner perianth-segments up to 2 cm. long, oblanceolate, obtuse or apiculate, sometimes retuse, rose-colored to light purple, widely spreading; filaments, style, and stigma-lobes white; ovary naked; seeds oblong, 1 mm. long.

Type locality: Mexico.
Distribution: Central Mexico.

This species was collected in Mexico and sent to Europe by Karwinsky about 1840. Only three specimens were sent in the first shipment, one of which sold for $200. As a medium-sized plant weighs less than half an ounce, this price was somewhat in excess of its weight in gold! This plant was named for Prince Kotschoubey who was a prominent patron of horticulture. He paid a thousand francs for one of these plants.

FIG. 96.—Ariocarpus kotschoubeyanus.

We have not seen Lemaire's original reference to *Anhalonium kotschoubeyanum*, but in all his subsequent references the name is spelled as given here. Schumann, however, spells the name as follows: *Ariocarpus kotschubeyanus*.

Stromatocactus kotschoubeyi Karwinsky and *Anhalonium fissipedum* Monville were given by Lemaire (Illustr. Hort. 16: Misc. 72. 1869) as synonyms of *A. kotschoubeyanum* and by Rümpler (Förster, Handb. Cact. ed. 2. 232. 1885) as synonyms of *A. sulcatum*. *Ariocarpus mcdowellii* (Haage and Schmidt, Cat. 225. 1908), unpublished, belongs here. Dr. Rose obtained living specimens from McDowell in 1906.

Cactus kotschoubeyi Karwinsky (Hort. Univ. 6: 63. 1845) was recorded by Lemaire while the Index Kewensis refers the name to Otto Kuntze (Rev. Gen. Pl. 1: 206. 1891), where the transfer is technically made.

The plant, as *Mammillaria sulcata*, is described in the Gardeners' Chronicle (III. 30: 255. 1901) but no author is given and the article is unsigned. The name also occurs in the Index Kewensis (3: 160. 1894), credited to Salm-Dyck (Cact. Hort. Dyck. 1849. 78. 1850), but he never used this combination. The reference of Salm-Dyck which is cited is to *Anhalonium sulcatum*.

Illustrations: Gartenwelt 15: 538, as *Anhalonium kotschubeyanum;* Gard. Chron. III. 30: 255. f. 74, as *Mammillaria sulcata;* Monatsschr. Kakteenk. 7: 10; Cact. Journ. 1: 44, as *Ariocarpus sulcatus;* Bot. Jahrb. Engler 24: 544; Cact. Journ. 1: pl. for January and September; Schumann, Gesamtb. Kakteen f. 96; Ann. Rep. Smiths. Inst. 1908: pl. 3, f. 4; Journ. Hered. Washington 6?: f. 5; Monatsschr. Kakteenk. 10: 184; Rep. Mo. Bot. Gard. 9: pl. 33; Blühende Kakteen 1: pl. 52 a; Möllers Deutsche Gärt. Zeit. 25: 477. f. 11, No. 8; 29: 75. f. 4; Gartenwelt 15: 217.

*Sometimes spelled *kotschubei*.

Plate VIII, figure 3, shows a plant sent by Professor Lloyd from Zacatecas in 1908, which flowered at the New York Botanical Garden in 1911. Figure 96 is from a photograph of a plant sent by Dr. Elswood Chaffey from Zacatecas, Mexico, in 1910.

3. **Ariocarpus fissuratus** (Engelmann) Schumann in Engler and Prantl, Pflanzenfam. 3^{6a}: 195. 1894.

Mammillaria fissurata Engelmann, Proc. Amer. Acad. 3: 270. 1856.
Anhalonium fissuratum Engelmann, Cact. Mex. Bound. 75. 1859.
Anhalonium engelmannii Lemaire, Cactées 42. 1868.
Ariocarpus lloydii Rose, Contr. U. S. Nat. Herb. 13: 308. 1911.

Plant body scarcely appearing above the ground, flat or somewhat rounded, sometimes 15 cm. broad; tubercles imbricated, ovate, the upper part 2 to 3 cm. broad at base, acute or obtuse, the whole surface more or less fissured and irregularly warty; areoles filled with a dense mass of hairs; flowers 3 to 4 cm. broad, white to purple; inner perianth-segments oblong-oblanceolate; style and stigma-lobes white; fruit oval, pale green, 10 mm. long; seeds black, tuberculate-roughened.

Type locality: Near the junction of the Pecos with the Rio Grande.

Distribution: Western Texas and northern Coahuila and Zacatecas, Mexico.

Engelmann refers here (Cact. Mex. Bound. 74) *Mammillaria heteromorpha* Scheer (*Anhalonium heteromorphum* Trelease in Engelmann's Botanical Works 537. 1887), basing his conclusions on a skeleton specimen so labeled in Salm-Dyck's collection. The species described under that name by Salm-Dyck (Cact. Hort. Dyck. 1849. 128. 1850) is certainly not of this genus.

This plant is generally known as living rock. It is dull gray to brown in color and grows on dry stony ground and, when not in flower, is easily mistaken for the rocks which surround it.

Illustrations: Cact. Mex. Bound. pl. 16; Dict. Gard. Nicholson 4: 563. f. 34, as *Mammillaria fissurata;* Illustr. Hort. 16: pl. [605a]; Förster, Handb. Cact. ed. 2. f. 20, as *Anhalonium engelmannii;* Cact. Journ. 2: 109; Gartenwelt 15: 538; Amer. Gard. 11: 465; Dict. Gard. Nicholson Suppl. 51. f. 48; Journ. Amer. Chem. Soc. 18: f. 4; Arch. Exper. Path. 34: 70. f. 1; 376; Goebel, Pflanz. Schild. 1: f. 14, 44; pl. 2, f. 7, as *Anhalonium fissuratum;* Contr. U. S. Nat. Herb. 13: pl. 63; Stand. Cycl. Hort. Bailey 1: f. 373; Möllers Deutsche Gärt. Zeit. 29: 73. f. 1, as *Ariocarpus lloydii;* Contr. U. S. Nat. Herb. 13: pl. 62; Rep. Mo. Bot. Gard. 9: pl. 32; Blühende Kakteen 1: pl. 52, b; Bull. Univ. Texas 82: pl. 4, f. 1; Engler and Prantl, Pflanzenfam. 3^{6a}: f. 68; Cact. Journ. 1: pl. for January and September; Ann. Rep. Smiths. Inst. 1908: pl. 5, f. 1; Schelle, Handb. Kakteenk. f. 200; Möllers Deutsche Gärt. Zeit. 25: 477. f. 11, No. 6; 29: 74. f. 2, 3; Gartenwelt 15: 343; Alianza Cientifica Universal 3: opp. 150 (2 plates); Arch. Exper. Path. 34: 376; West Amer. Sci. 13: 2; Floralia 42: 369.

Figure 95 is from a photograph of a plant collected by Dr. Rose at Langtry, Texas, in 1908.

3. **LOPHOPHORA** Coulter, Contr. U. S. Nat. Herb. 3: 131. 1894.

Plant small, simple or proliferous, spineless (seedlings having a few weak pubescent bristle-like spines), very succulent; ribs very broad and rounded, bearing few low tubercles; areoles round, bearing flowers only when young, always filled with a tuft of erect matted hairs; flowers borne at the center of the plant, small, rotate-campanulate, white to rose-tinted; fruit club-shaped, naked, red to pinkish, maturing rapidly; seeds black, tuberculate-roughened.

Type species: *Echinocactus williamsii* Lemaire.

One species is here recognized but some writers have accepted two.

The generic name is from λόφος crest, and φορέω I bear, referring to the pencil of hairs borne at the areole.

This very curious little plant, although referred in turn to *Echinocactus*, *Mammillaria*, and *Anhalonium*, has very little in common with any of those genera. In the origin of the flower it is like *Echinocactus*, but otherwise it is very different. In its globular habit and

the shape and size of the flowers it resembles many of the plants heretofore passing as *Mammillaria*, but it has very different seeds, flowers, areoles, and structure. In its fruits, seeds, and flowers it approaches *Ariocarpus*, but in other respects it is very different.

1. Lophophora williamsii (Lemaire) Coulter, Contr. U. S. Nat. Herb. **3**: 131. 1894.

Echinocactus williamsii Lemaire in Salm-Dyck, Allg. Gartenz. **13**: 385. 1845.
Anhalonium williamsii Lemaire in Förster, Handb. Cact. ed. 2. 233. 1885.
Anhalonium lewinii Hennings, Gartenflora **37**: 410. 1888.
Mammillaria williamsii Coulter, Contr. U. S. Nat. Herb. **2**: 129. 1891.
Lophophora williamsii lewinii Coulter, Contr. Nat. Herb. **3**: 131. 1894.
Echinocactus lewinii Hennings, Monatsschr. Kakteenk. **5**: 94. 1895.
Mammillaria lewinii Karsten, Deutsche Fl. ed. 2. **2**: 457. 1895.
Lophophora lewinii Thompson, Rep. Mo. Bot. Gard. **9**: 133. 1898.

Plants dull bluish green, globular to top-shaped or somewhat flattened at top, 5 to 8 cm. broad, with a thickened tap-root sometimes 10 cm. long or more; ribs 7 to 13, nearly vertical or irregular and indistinct, tubercled; flowers central, each surrounded by a mass of long hair, pale pink to white, 2.5 cm. broad when fully open, with a broad funnelform tube; outer perianth-segments and scales green on the back, callous-tipped; filaments much shorter than the perianth-segments, nearly white; style white below, pinkish above, shorter than the perianth-segments; stigma-lobes 5, linear, pinkish; ovary naked; fruit 2 cm. long or less; seeds 1 cm. in diameter, with a broad basal hilum.

Type locality: Not cited.

Distribution: Central Mexico to southern Texas.

FIG. 97.—Lophophora williamsii.

This plant contains a narcotic and has been the subject of much study regarding its chemical, medicinal, and therapeutic properties. Dr. L. Lewin isolated an alkaloid which he named anhalonin. Since then one or more other alkaloids have been discovered. The active drug contained in this plant, however, it is claimed, does not lie in the alkaloids but in certain resinous bodies discovered by Dr. Erwin E. Ewell. The dried plants have been used since pre-Columbian times by certain North American Indians in some of their religious ceremonies and dances. The physiological effects which follow the eating of the dried plants are remarkable visions, and these have been described in considerable detail by writers who have visited the Indians and who have recorded laboratory experiences. There is considerable commerce carried on in this plant by some of the Indian tribes, although it is forbidden by law. The globular plants are sliced into 3 or 4 sections and then dried in the sun and these dried pieces form the mescal buttons of the trade.

According to Safford (Journ. Hered. Washington **8**: f. 5, 6, 7. 1916), Bernardo Sahagun in the sixteenth century spoke of its use by the Indians of Mexico; Sahagun, however, supposed the plant was a fungus, and called it teonanactl or "sacred mushroom."

This species is known variously as pellote, peyote, mescal button, devil's root, or sacred mushroom; it is sometimes also called the dumpling cactus and, according to Mr. Robert Runyon, challote in Starr County, Texas.

The name *Ariocarpus williamsii* Voss (Vilm. Blumengärtn. 368), according to the Monatsschrift für Kakteenkunde (**7**: 32. 1907), has been used, but whether it was formally published we do not know.

Anhalonium rungei Hildmann and *A. subnodusum* Hildmann (Monatsschr. Kakteenk. **3**: 68. 1893) are only names, but doubtless belong here; *A. visnagra* (Monatsschr. Kakteenk. **6**: 174. 1896) should perhaps also be referred here.

1

2

1. *Lophophora williamsii.*
2. *Ariocarpus retusus.*

Here probably belong *Anhalonium jourdanianum* Lewin (Ber. Deutsch. Bot. Gess. 12: 289. 1894), *Anhalonium jourdanianum* (Monatsschr. Kakteenk. 6: 180. 1896), and *Echinocactus jourdanianus* Rebut (Monatsschr. Kakteenk. 15: 122. 1905).

Illustrations: Journ. Hered. Washington 6[7]: f. 10, as *Lophophora;* De Laet, Cat. Gen. f. 13, as *Echinocactus williamsii lewinii;* Cact. Journ. 1: pl. for September, December; Journ. Hered. Washington 6[7]: f. 9; Rep. Mo. Bot. Gard. 9: pl. 37, as *Lophophora lewinii;* Journ. Amer. Chem. Soc. 18: f. 2, 7; Arch. Exper. Path. 34: pl. 1, f. 4; also 376. f. 1; Gartenflora 37: f. 92; Gartenwelt 15: 538; Journ. Hered. Washington 6[7]: f. 8; Monatsschr. Kakteenk. 1: facing 93, as *Anhalonium lewinii;* Arch. Exper. Path. 34: pl. 1, f. 3; Rümpler, Sukkulenten 190. f. 107; Gartenwelt 15: 538; Gartenflora 37: f. 93; Möllers Deutsche Gärt. Zeit. 29: 78. f. 9; Journ. Amer. Chem. Soc. 18: f. 1, 3; Cact. Journ. 2: 109, as *Anhalonium williamsii;* Curtis's Bot. Mag. 73: pl. 4296; Monatsschr. Kakteenk. 4:37; 13:52; Pfeiffer, Abbild. Beschr. Cact. 2: pl. 21; Schumann, Gesamtb. Kakteen f. 55; Blühende Kakteen 3: pl. 149; Loudon, Encycl. Pl. ed. 3. 1377. f. 19372; Schelle, Handb. Kakteenk. 150. f. 77; Möllers Deutsche Gärt. Zeit. 25: 477. f. 11, No. 23; De Laet, Cat. Gén. f. 12, as *Echinocactus williamsii;* Gartenwelt 15: 538, as *Anhalonium jourdanianum;* Smiths. Misc. Coll. 70: f. 111; Rep. Mo. Bot. Gard. 9: pl. 36; Journ. Hered. Washington 6[7]: f. 1 to 3, 6, 7, 9; Saunders, Useful Wild Plants U. S. Canada 253; Cact. Journ. 1: pl. for September, December; Ann. Rep. Smiths. Inst. 1908: pl. 3, f. 5; 1916: 424. pl. 5, 6, 7.

Plate IX, figure 1, is from a photograph of a plant sent from Zacatecas, Mexico, by Dr. Elswood Chaffey, in 1910; plate X, figure 3, shows a flowering plant from Zacatecas in the collection of the New York Botanical Garden; figure 4 shows another plant received from France in 1901. Figure 97 is from a photograph taken by Robert Runyon near Brownsville, Texas, in 1921.

4. COPIAPOA gen. nov.

Simple, globular to elongate-cylindric, or in one species forming large clumps or mounds containing hundreds of simple globular stems; areoles borne on definite ribs; top of plant covered with dense soft wool; flowers from the top of the plant, nearly hidden in the wool, campanulate to funnelform, yellow or sometimes tinged with red, with very short but broad tube; ovary short, turbinate, naked; fruit small, smooth, crowned with green, persistent, sepal-like scales; seed large, glossy, black, with large depressed hilum.

Type species: *Echinocactus marginatus* Salm-Dyck.

To this genus we are able to refer some 14 described species heretofore included in *Echinocactus* by authors. Most of the species are to be found in Salm-Dyck's section, *Cephaloidei*, while Schumann scatters them through his subgenus *Cephalocactus* which is a very unnatural group, containing 11 very diverse species. All the species of *Copiapoa* are from the coastal region of northern Chile. This region, although large and varied, does not possess this number of species. We recognize 6. Dr. Rose who collected here in 1914 obtained 3 of these of which he brought back living and herbarium specimens.

The generic name is derived from Copiapo, one of the provinces of Chile.

KEY TO SPECIES.

Plants with fibrous roots.
- Plants cylindric.
  - Ribs 18 ..... 1. *C. cinerea*
  - Ribs 8 to 12 ..... 2. *C. marginata*
- Plants globose.
  - Plants clustered, forming large mounds ..... 3. *C. coquimbana*
  - Plants not forming large mounds.
    - Ribs 20 or 21 ..... 4. *C. cinerascens*
    - Ribs 8 to 13 ..... 5. *C. echinoides*

Plants with large fleshy roots ..... 6. *C. megarhiza*

1. Copiapoa cinerea (Philippi).

Echinocactus cinereus Philippi, Fl. Atac. 23. 1860.

Simple, cylindric, 20 cm. high, 10 cm. in diameter, covered with wool at the apex; ribs 18, broad, obtuse; spine solitary or sometimes 5 or 6, terete, black; upper radials 4 mm. long; lower radials 12 to 16 mm. long; central spine 18 to 20 mm. long; flowers funnelform, 18 to 30 mm. long, 2.5 cm. broad, yellow; ovary naked; fruit 1.5 to 2 cm. long; seeds black and shining.

Type locality: Along the coast of Chile from Taltal to Cobre.

Distribution: Western Chile.

This species is similar to *Copiapoa marginata* but has more ribs and very different armament.

FIG. 98.—Copiapoa cinerea.

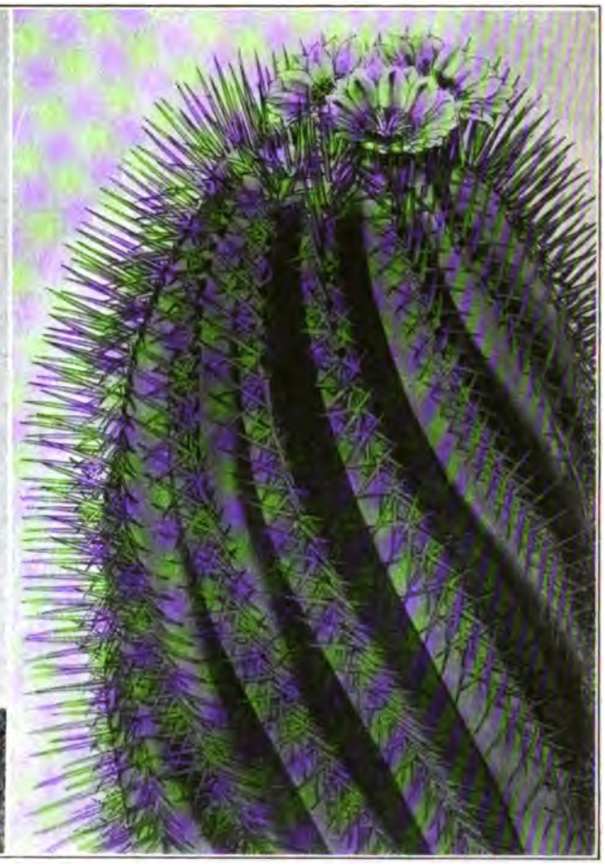


FIG. 99.—Copiapoa marginata.

We have seen no living specimens of this species, but Dr. Rose obtained a small piece of the type from the Philippi Herbarium. This agrees very well with Schumann's illustration cited below.

Illustrations: Schumann, Gesamtb. Kakteen Nachtr. f. 15; Monatsschr. Kakteenk. 11: 7, as *Echinocactus cinereus*.

Figure 98 is copied from the first illustration above cited.

2. Copiapoa marginata (Salm-Dyck).

Echinocactus marginatus Salm-Dyck, Allg. Gartenz. 13: 386. 1845.
Echinocactus columnaris Pfeiffer, Abbild. Beschr. Cact. 2: under pl. 14. 1847.
Echinocactus streptocaulon Hooker in Curtis's Bot. Mag. 77: pl. 4562. 1851.
Echinocactus melanochnus Cels in Labouret, Monogr. Cact. 174. 1853.

M. E. Eaton del.

1. Flowering plant of *Echinopsis aurea*.
2. Flowering plant of *Copiapoa coquimbana*.
3. Flowering plant of *Lophophora williamsii*.
4. Flowering plant of same.

(All natural size.)

A. Horn & Co.

Plants subcylindric, growing in clusters of 2 to 9, usually erect, but when old often 6 dm. long and spreading with ascending tips, about 12 cm. in diameter; ribs 8 to 12, low, separated by broad intervals; young areoles and tops of flowering plants filled with masses of soft brown hair; areoles large, approximate, the adjoining ones usually touching; spines 5 to 10, unequal, subulate, stout, the longer one 3 cm. long; flowers small, 2.5 cm. long; outer perianth-segments broad, obtuse, with red tips; inner perianth-segments yellow; stamens included; fruit naked, small, 8 mm. long; seeds black, shining.

Type locality: Chile.

Distribution: Coastal hills of Antofagasta, Chile.

The four species, referred above as synonyms of this one, were described between 1845 and 1853 and may have come from the same source. Two of them are said to have been from Bolivia, but at the time they were described, Antofagasta, now a part of Chile, belonged to Bolivia. Dr. Rose, when collecting in Chile in 1914 (No. 19410), found these plants very common on the dry hills above Antofagasta, and a number of fine specimens were sent to the New York Botanical Garden.

We are following Pfeiffer in referring *E. columnaris* to this species. According to Pfeiffer, both species came from Valparaiso, Chile, but Dr. Rose could find no plant of this relationship about Valparaiso. Mr. Söhrens, whom he consulted, believes that Pfeiffer's station was wrongly recorded.

Illustrations: Pfeiffer, Abbild. Beschr. Cact. **2**: pl. 30, as *Echinocactus marginatus;* Curtis's Bot. Mag. **77**: pl. 4562; Loudon. Encycl. Pl. ed. 3. 1378. f. 19376, as *Echinocactus streptocaulon.*

Figure 99 is copied from the second illustration above cited.

3. Copiapoa coquimbana (Karwinsky).

Echinocactus coquimbanus Karwinsky in Förster, Handb. Cact. ed. 2. 601. 1885.

Plants clustered, forming mounds up to 1 meter broad and 6 dm. high, composed of several hundred heads; individual heads 12 cm. in diameter or less, pale green, at flowering time crowned by a dense mass of long white wool; ribs 10 to 17, obtuse, somewhat tubercled; radial spines 8 to 10, slender, straight or somewhat recurved; central spines 1 or 2, stouter, straight, 1.5 to 2.5 cm. long, black to gray; flowers campanulate, 3 cm. long; outer perianth-segments distinct, linear, acute, green; inner perianth-segments oblanceolate, yellow, obtuse; tube nearly or quite wanting; filaments, style, and stigma-lobes yellow; ovary small, turbinate, naked.

Type locality: Near the town of Coquimbo, Chile.

Distribution: Province of Coquimbo, Chile.

The Philippi Herbarium at Santiago de Chile has a specimen from Coquimbo, near La Serena, labeled "*Echinocactus cinerascens* Lemaire," which is doubtless to be referred here. *E. cinerascens* originally came from Copiapo, an interior town, much farther north than Coquimbo. Dr. Rose found this species very abundant on the hills near La Serena not far from Coquimbo (No. 19261).

Related to this species, and perhaps not distinct from it, is *Echinocactus fiedlerianus* Schumann (Gesamtb. Kakteen Nachtr. 121. 1903), but it grows farther north, not along the coast but in an interior valley. The type was collected by Mr. Söhrens near Vallenar, Huasco, Chile. Dr. Rose did not obtain specimens but he is now confident that this is the plant which he saw in great abundance just south of Vallenar. Schumann misunderstood the relationship for he places it between *Echinocactus megalothelos* and *E. schickendantzii,* two species of *Gymnocalycium.* It may be briefly characterized as follows:

Cespitose, with a turnip-like root, depressed-globose, grayish, covered with copious wool at the apex; ribs 13, tuberculate; areoles depressed; radial spines 4 to 7, 3 cm. long, subulate; flowers yellow, greenish without.

Illustration: Blühende Kakteen **3**: pl. 121, as *Echinocactus coquimbanus.*

Plate X, figure 2, shows one of the plants collected by Dr. Rose in flower.

4. Copiapoa cinerascens (Salm-Dyck).

Echinocactus cinerascens Salm-Dyck, Allg. Gartenz. **13**: 387. 1845.
Echinocactus copiapensis Pfeiffer, Abbild. Beschr. Cact. **2**: under pl. 14. 1847.
Echinocactus conglomeratus Philippi, Fl. Atac. 23. 1860.
Echinocactus ambiguus Hildmann in Schumann, Gesamtb. Kakteen 311. 1898.

Globose, about 8 cm. in diameter, green, the apex covered with gray wool; ribs 20 or 21, somewhat compressed; areoles 6 to 20 mm. apart; radial spines 8, usually 10 to 12 mm. long; central spines 1 or 2, 18 to 25 mm. long, stouter than the radials, all rigid, yellowish or grayish; flowers yellow; outer perianth-segments acute, often recurved; inner perianth-segments lanceolate, erose, or dentate.

Type locality: Copiapo, Chile.

Distribution: West coast of northern Chile.

In the original description of *Echinocactus ambiguus* it is stated that the ovary is probably scaly and woolly, but this is doubtless wrong. In all the species of *Copiapoa*, the ovary is buried in a mass of wool but this arises from the areoles about the base of the flower. This plant is known to us only from descriptions and figures.

Echinocactus intricatus longispinus Monville (Labouret, Monogr. Cact. 178. 1853) was referred here as a synonym.

Illustrations: Grässner, Haupt-Verz. Kakteen **1912**: 5; Möllers Deutsche Gärt. Zeit. **25**: 474. f. 6, No. 7; Monatsschr. Kakteenk. **14**: 89. f. a, as *Echinocactus cinerascens*.

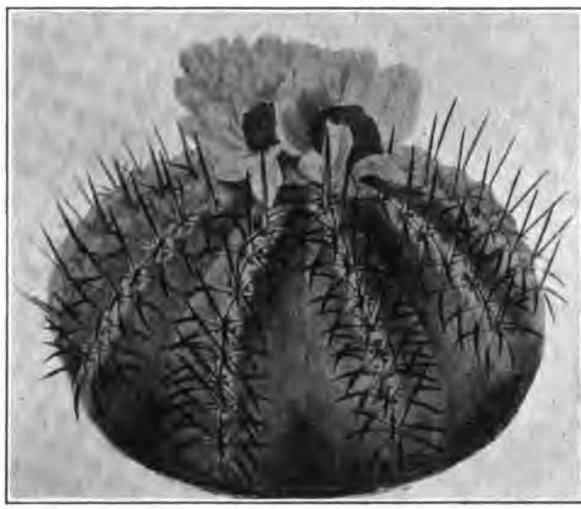


FIG. 100.—Copiapoa echinoides.

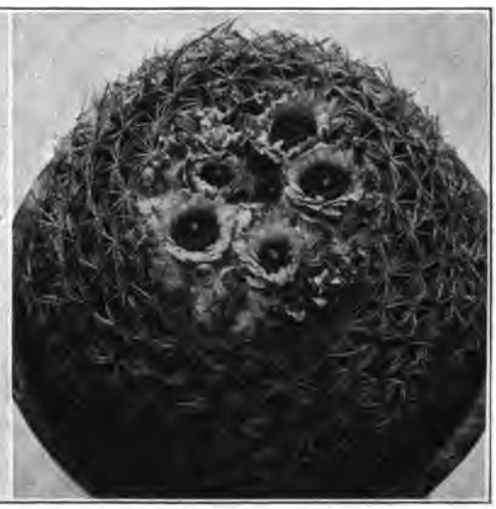


FIG. 101.—Pediocactus simpsonii.

5. Copiapoa echinoides (Lemaire).

Echinocactus echinoides Lemaire in Salm-Dyck, Allg. Gartenz. **13**: 386. 1845.
Echinocactus bridgesii Pfeiffer, Abbild. Beschr. Cact. **2**: pl. 14. 1847.
Echinocactus bolivianus Pfeiffer, Abbild. Beschr. Cact. **2**: under pl. 14. 1847.
? Echinocactus salm-dyckianus Pfeiffer, Abbild. Beschr. Cact. **2**: under pl. 14. 1847.

Simple, globose, very woolly at apex; ribs 8 to 13, straight, rounded, green; radial spines 5 to 7, stout, straight or somewhat curved; central spine solitary, porrect, 3 cm. long; flowers pale yellow; outer perianth-segments narrowly ovate, acute, reddish; inner perianth-segments broadly oblong, obtuse; scales of ovary and flower-tube described by Schumann as woolly in their axils, but undoubtedly he is wrong.

Type locality: Not cited.

Distribution: Reported from Bolivia, but perhaps from that part of Bolivia now belonging to Chile.

This name occurs first in Cels's Catalogue of 1845, but without description. We know the plant only from descriptions and illustrations; it may not belong to this genus.

Echinocactus macracanthus Salm-Dyck (Cact. Hort. Dyck. 1849. 143. 1850) may belong here. The varieties *Echinocactus macracanthus cinerascens* Salm-Dyck and *E. pepinianus affinis* Monville were both referred by Labouret (Monogr. Cact. 177. 1853) as synonyms of *Echinocactus macracanthus* Salm-Dyck.

Illustrations: Pfeiffer, Abbild. Beschr. Cact. 2: pl. 29, as *Echinocactus echinoides;* Pfeiffer, Abbild. Beschr. Cact. 2: pl. 14, as *Echinocactus bridgesii.*

Figure 100 is copied from the first illustration above cited.

6. Copiapoa megarhiza sp. nov.

Plants with large fleshy roots, sometimes 25 cm. long and 7 to 8 cm. in diameter, usually single, rarely in 2's and 3's, globular to elongate-cylindric, 8 to 26 cm. long, 4 to 9 cm. in diameter, dull green to almost white; ribs usually 13, very low; crown of plant covered with long white wool at flowering time; spines about 12, 1.5 cm. long, rather stout, at first yellow but soon gray; flowers yellow, 2.5 cm. long; fruit green, 6 to 8 mm. long, naked, crowned by 5 green scales; seeds black, 2 mm. long.

Collected by J. N. Rose on the very dry granitic hills near Copiapo, Chile, October 12, 1914 (No. 19323).

Two other species, *Echinocactus cinerascens* Lemaire and *E. copiapensis* Pfeiffer, were described as coming from Copiapo, but whether from the town or the province we do not know. Both have more ribs than the plant here described.

COPIAPOA sp.

A living specimen was collected by Dr. Rose, October 14, 1914, at Tres Cruces, north of Coquimbo, which was sent to the New York Botanical Garden under No. 19339. It may be described as follows:

Single, globular, about 1 cm. in diameter; ribs 11 or 12, obtuse; spines usually 10, brown at first, afterwards gray, subulate.

PUBLISHED SPECIES, PERHAPS OF THIS GENUS.

The four following species are probably of this relationship, but too little is known of them to place them definitely:

ECHINOCACTUS HUMILIS Philippi, Fl. Atac. 23. 1860. Not Pfeiffer, 1837.

Very small, depressed, subglobose, 2.5 cm. broad by 2 cm. high; ribs 10 to 12, tuberculate; radial spines 10 to 12, setaceous, spreading; central spine 1, 2.2 cm. long; flowers yellow, 2 cm. long.

Type locality: Paposo, Antofagasta, Chile.

Distribution: Antofagasta, Chile.

Paposo, the type locality of this species is on the coast north of Taltal. This species seems never to have been re-collected. It was not found in the Philippi Herbarium at Santiago and was unknown to Mr. Söhrens. The name being a homonym must be rejected.

ECHINOCACTUS FOBEANUS Mieckley, Monatsschr. Kakteenk. 17: 187. 1907.

Globose, 8 to 10 cm. in diameter, dark green, somewhat depressed and white-woolly at apex; ribs 14, spiraled; radial spines 8 or 9, black when young, 12 mm. long; central spines when present 1 or 2; flowers pale yellow.

This species is known only from the description of specimens which flowered in the Berlin Botanic Garden. It is supposed to have come from Chile and seems to be of this relationship although we can not definitely refer to it any species which we here recognize. A photograph of a small grafted plant is the only illustration we know (Möllers Deutsche Gärt. Zeit. 25: 474. f. 6, No. 15).

ECHINOCACTUS LINDLEYI Förster, Hamb. Gartenz. 17: 162. 1861.

Nearly globular or a little broader than high, 7.5 cm. high; ribs 12, broad, rounded; areoles 1.5 cm. apart; spines yellowish brown at first, but in age only the tips brown; radial spines 9 to 11, spreading, 1.5 to 2 cm. long; central spines 2, the longest 3 to 3.5 cm. long.

Type locality: Probably Peru.

Its flowers were unknown when described and it has disappeared from collections although it is said to be very ornamental. It was referred to Salm-Dyck's group, *Cephaloidei*, to which most of the species of *Copiapoa* were referred.

ECHINOCACTUS PYRAMIDATUS Förster, Hamb. Gartenz. 17: 162. 1861.

Short-pyramidal, about 18 cm. high, 13 cm. in diameter; ribs 15; areoles 4 to 6 mm. apart; spines stiff, reddish brown; radial spines 8; central spines 3, 3 to 3.5 cm. long, stout; flowers yellow.

Type locality: Probably Peru.

5. **PEDIOCACTUS** Britton and Rose in Britton and Brown, Illustr. Fl. ed. 2. 2: 569. 1913.

Globular, single or cespitose, small, strongly tubercled cacti; tubercles borne on spiraled ribs; young areoles very woolly, but in age nearly naked; flowers small, with a rather indefinite funnel-shaped tube, pinkish, broadly campanulate; outer perianth-segments smaller than the inner and duller in color; inner perianth-segments oblong, numerous; scales on flower-tube few, naked in their axils; stamens numerous; ovary green, nearly globular, with a few scales towards the top, and a depressed scar at apex; fruit dry, greenish, splitting on one side; seeds dull black, tuberculate, keeled on the back with a large sub-basal hilum.

Type species: *Echinocactus simpsonii* Engelmann.

The plant has been described both as a *Mammillaria* and as an *Echinocactus*. In its globular shape and strongly tubercled surface it resembles very much many of the so-called *Mammillaria*, but the tubercles are really borne on ribs, while the flowers are borne near the center of the plant and originate just above the spines; therefore, this genus belongs to the *Echinocactanae* rather than to the *Coryphanthanae;* the seeds are unlike those of *Coryphanthanae*.

We recognize one species.

The generic name is from πεδίον a plain, and κάκτος cactus, referring to the general habitat of the plant.

1. **Pediocactus simpsonii** (Engelmann) Britton and Rose in Britton and Brown, Illustr. Fl. ed. 2. 2: 570. 1913.

Echinocactus simpsonii Engelmann, Trans. St. Louis Acad. 2: 197. 1863.
Echinocactus simpsonii minor Engelmann, Trans. St. Louis Acad. 2: 197. 1863.
Mammillaria simpsonii Jones, Zoe 3: 302. 1893.
Mammillaria purpusii Schumann, Monatsschr. Kakteenk. 4: 165. 1894.
Echinocactus simpsonii robustior Coulter, Contr. U. S. Nat. Herb. 3: 377. 1896.

Plants depressed, globular, up to 15 cm. broad by 12 cm. high, strongly tuberculate; the tubercles contiguous; radial spines 15 to 20, spreading, white, acicular; central spines usually 5 to 7, more or less spreading, stouter and longer than the radials, 1 to 3 cm. long, the base white but the upper part reddish brown or brown throughout; flower-buds obtuse; flowers massed in the center and surrounded by brown or whitish wool; outer perianth-segments oblong, obtuse, their margins scarious and serrulate; inner perianth-segments linear-oblong, acutish; filaments golden yellow; style and stigma-lobes yellowish.

Type locality: Butte Valley in the Utah desert and Kobe Valley, farther west.

Distribution: Kansas to New Mexico, north to Nevada, Washington, Idaho, and Montana.

These plants often take on very weird shapes, very unlike the normal form, and then are called the snake cactus or brain cactus. We have photographs of some of these abnormal plants taken by Mr. M. E. Jones in Utah and Nevada.

The beautiful flowers close partially at night.

Mammillaria spaethiana Schumann, listed by Späth (Cat. 1894–1895), seems never to have been described. Schumann afterwards withdrew the name and Mrs. Brandegee (Zoe 5: 31. 1900) states that it has the seeds of *Echinocactus simpsonii* and she believes it to be one of the forms of this species.

The species as here treated covers a wide range and is represented by several striking forms. The one from the state of Washington has very dark, nearly black spines, the radials ascending and subulate. We have not seen this plant in flower but the flower-scar is at the spine-areole, as it always is in this genus. Mr. Charles V. Piper in his Flora of Washington says "quite certainly new." It is possibly a good species. Here we would also refer a plant collected by J. E. Edwards near Haycreek, Oregon. It is possible, as Coulter believed, that these are the same as the Nevada form which represents Engelmann's variety *robustior* and this view has been held by others. (See Cact. Journ. 2: 157.)

This Washington plant seems to have been collected more than 70 years ago, but the specimen has apparently been lost and the record overlooked. Our attention was called to this old record of Geyer, by Mr. C. V. Piper, here reproduced:

"A third species of *Mammillaria* I found on the Oregon plains while searching for a *Melocactus*. Of this I brought dry specimens to London and Mr. Scheer, at Kew, has already raised several from seeds. The above-mentioned *Melocactus* was gathered by Chief Factor MacDonald at Fort Colville, but the exact habitat was forgotten; the one specimen found was afterwards in possession of Dr. Tolmie on the lower Columbia. From the information I could gather at Fort Walla Walla, the true habitat of this cactus is at the Priests' Rapid,' on a rocky island in the Columbia River, about 60 miles above Fort Walla Walla. I received this intelligence too late, but hope that by publishing it other botanists may have the opportunity of getting the plant without loss of time."—Charles A. Geyer. (The London Journal of Botany 5: 25. 1846.)

Illustrations: Simpson's Rep. pl. 1, 2; Britton and Brown, Illustr. Fl. 2: f. 2524; Knippel, Kakteen pl. 11; Förster, Handb. Cact. ed. 2. 593. f. 76; Schelle, Handb. Kakteenk. 135; Gard. Chron. II. 6: 293. f. 60; III. 8: 166. f. 26, as *Echinocactus simpsonii;* Thomas, Zimmerkultur Kakteen 53; Gartenwelt 1: 85; Monatsschr. Kakteenk. 4: 167, as *Mammillaria purpusii;* Britton and Brown, Illustr. Fl. ed. 2. 2: f. 2983.

Plate VIII, figure 1, was painted from a plant collected by A. Nelson in Wyoming in 1914 and sent by Dr. Rose to the New York Botanical Garden. Figure 101 is from a photograph of the same plant.

6. TOUMEYA gen. nov.

A small, ovoid or short-cylindric cactus, the areoles borne on low spirally arranged tubercles; spines thin, flat, white, shining, papery, flexible, the central ones much longer than the radial; flowers central, about as wide as long, white, borne at the spine-areoles on nascent tubercles; ovary bearing a few minute scales, their axils naked; outer perianth-segments ovate, acute, the inner lanceolate, acuminate; perianth-tube short, bearing several papery lanceolate scales; fruit dry, globose, smooth; seeds compressed, oblique, black.

Type species: *Mammillaria papyracantha* Engelmann. A monotypic genus of New Mexico.

The generic name is in honor of Dean James W. Toumey, whose studies and collections of cacti have greatly aided our investigations.

1. Toumeya papyracantha (Engelmann).

Mammillaria papyracantha Engelmann, Pl. Fendl. 49. 1849.
Echinocactus papyracanthus Engelmann, Trans. St. Louis Acad. 2: 198. 1863.

Simple with fibrous roots, 5 to 10 cm. long; "ribs 8, oblique" but probably very indefinite even in living plants, bearing low distinct tubercles; areoles small, circular, pubescent when young, naked in age, the lower ones described as proliferous; spines chartaceous, the radials 8 to 10, unequal, 3 to 20 mm. long, spreading; central spines 1 to 4, 3 to 4 cm. long, the upper ones connivent over the

top of the plant; flower 2.4 to 2.6 cm. long, a little broader when fully expanded, white; fruit nearly naked, globular, 4 to 6 mm. in diameter, thin-walled; seeds large, 2 to 2.5 mm. broad, somewhat pointed at base, angled on the back; hilum large, sub-basal.

Type locality: Between the lower hills near Santa Fé, New Mexico.

Distribution: Rare in isolated localities in northern New Mexico; reported from California by Watson (Cact. Journ. 1: 43), probably erroneously.

This is a remarkable plant whose generic position has been uncertain. Engelmann, who first described it as a *Mammillaria* and afterwards as an *Echinocactus*, associates it with *Echinocactus simpsonii*, that is, *Pediocactus simpsonii*, as representing a small group of *Echinocactus* "with the appearance of *Mammillaria*."

It has been reported only a few times and the fruit has not heretofore been described.

Fendler reported it growing in loose red sandy fertile soil.

In 1893 (Zoe 3: 301) Mr. M. E. Jones published a note on this species and, on the basis of it, the plant has been admitted into the flora of Utah. He writes as follows:

"The flowers are an inch long, opening but little; stigma cleft a line deep into 6 anther-like divisions, papillose on the sides and upper surface; filaments 6 lines long; style almost as long as the petals, ½ a line thick, linear; the flowers open in the morning, and close in the afternoon, but apparently are not affected by cloudy weather. This grows in alkaline soil, and blooms in May. It is scarce everywhere."

He wrote in a letter (March 18, 1918) from Salt Lake City:

"The material that I thought was this species came from the desert west of here, towards Mount Ibapah. I remember very distinctly the appearances of the specimen but I did not collect it and I now have some doubts about its identity. The spines were papery. I have never seen it since, though I have hunted for it."

We have found a similar plant in the herbarium of the Philadelphia Academy of Sciences, collected by Siler in Utah, but it certainly is not the true *E. papyracanthus*. This, however, is only a slice from the plant and is without flowers or fruit; it may be described as follows:

Covered by a mass of spines; ribs numerous, low, tubercled; areoles close together, circular, white-felted when young; radial spines 10 to 12, white, about 10 mm. long, weak; central spines 3 to 5, weak and flexible, more or less twisted, 2 to 3 cm. long; some of them more or less flattened, pale or dark brown, one more or less hooked. A. L. Siler's note is as follows: "Only a few specimens have ever been found. Flowers of this were pink, not white, as described by Engelmann. Southern Utah, 1888."

Illustration: Cact. Journ. 1: pl. v, as *Echinocactus papyracanthus*.

7. EPITHELANTHA* Weber.

Plant globular, very small, the surface divided into numerous tubercles arranged in spiraled rows, mostly hidden by the numerous small spines; flowers very small, from near the center of the plant, arising from upper part of the spine-areole on the young tubercles; outer perianth-segments 3 to 5; inner perianth-segments few, often only 5; stamens few, usually 10, included; fruit small, clavate, red, few-seeded; seeds black, shining, rather large, with a large depressed hilum.

Type species: *Mammillaria micromeris* Engelmann.

We recognize one species, from western Texas and northern Mexico.

The generic name is from ἐπί on, θηλῆ nipple, and ἄνθος flower, indicating that the flower is borne on the tubercle.

This genus has heretofore been associated with the so-called *Mammillaria*, some of the species of which it resembles in its globose shape and small clavate red fruits. On account

*The name *Epithelantha* was given by Weber (Dict. Hort. Bois 804. 1898) as a synonym of *Mammillaria micromeris* and therefore was not formally published by him.

of the position of the flower, however, which is at the spine-areole, the genus is better referred to the sub-tribe, *Echinocactanae*, where in the genera *Lophophora* and *Ariocarpus* we have a similar fruit.

Mr. Charles Wright, in his field notes, first called attention to the central position of the flower of *Mammillaria micromeris*, and Engelmann, who discussed it (Cact. Mex. Bound. 4) in some detail, was in doubt as to its position. Dr. Weber seems to have been the first to determine the exact position of the flower and, recognizing its significance, proposed a new generic name for it, but he also referred it to *Echinocactus* and in still another place left it as a *Mammillaria*.

1. Epithelantha micromeris (Engelmann) Weber.

Mammillaria micromeris Engelmann, Proc. Amer. Acad. 3: 260. 1856.
Mammillaria micromeris greggii Engelmann, Proc. Amer. Acad. 3: 261. 1856.
Cactus micromeris Kuntze, Rev. Gen. Pl. 1: 260. 1891.
Cactus micromeris greggii Coulter, Contr. U. S. Nat. Herb. 3: 101. 1894.
Mammillaria greggii Safford, Ann. Rep. Smiths. Inst. 1908: 531. pl. 4, f. 1. 1909.

Plants small, simple or cespitose, nearly globular, but depressed at apex, 6 cm. in diameter or less; tubercles very low, small, arranged in many spirals, 1 mm. long; spines numerous, white, the lower radials about 2 mm. long, the upper radials on the young tubercles 6 to 8 mm. long and connivent over the apex, narrowly clavate, the upper half finally falling off; flowers from near the center of the plant in a tuft of wool and spines; flower very small, whitish to light pink, 6 mm. broad; perianth-segments 8 to 10; stamens 10 to 15; stigma-lobes 3; fruit 8 to 12 mm. long; seed 1.5 mm. broad.

Type locality: Western Texas.

Distribution: Western Texas and northern Mexico.

Writers generally, as well as dealers of these plants, are disposed to treat the large forms of this species as a variety, var. *greggii*, but we have observed no reason except size for this conclusion. The large form seems to extend throughout the range of the species proper. In June 1921, Mrs. S. L. Pattison sent us from western Texas an unusually large plant which was nearly 8 cm. high and 6 cm. in diameter.

FIG. 102.—Epithelantha micromeris.

The plant is known as button cactus. Its fruits, called chilotos, are slightly acid and are edible.

The names *Epithelantha micromeris* Weber and *Echinocactus micromeris* Weber, although both mentioned by him (Dict. Hort. Bois 804. 1898), were not formally published.

Mammillaria micromeris fungifera (Monatsschr. Kakteenk. 19: 140. 1909) is only a catalogue name.

Pelecyphora micromeris Poselger and Hildmann appears as a synonym of *Mammillaria micromeris* in Garten-Zeitung 4: 322. 1885.

Illustrations: Cact. Mex. Bound. pl. 1; 2, f. 1 to 4; Cact. Journ. 1: 43; pl. [2] for February in part; Rümpler, Sukkulenten 200. f. 115; Dict. Gard. Nicholson Suppl. 514. f. 545; Förster, Handb. Cact. ed. 2. 267. f. 26, 27; Cycl. Amer. Hort. Bailey 1: 203. f. 302; Stand. Cycl. Hort. Bailey 5: f. 3016; Amer. Garden 11: 460; Monatsschr. Kakteenk. 20: 126; 29: 81; Schelle, Handb. Kakteenk. 248. f. 166, 167; Garten-Zeitung 4: 323. f. 76; Watson, Cact. Cult. 167. f. 65; ed. 3. f. 42; Blanc, Cacti 71. f. 1394, as *Mammillaria micromeris;* Cact. Mex. Bound. pl. 2, f. 5 to 8; Blanc, Cacti 71. f. 1395, as *Mammillaria micromeris greggii;* Ann. Rep. Smiths. Inst. 1908: pl. 4, f. 1, as *Mammillaria greggii.*

Figure 102 shows a plant in fruit, collected by Dr. Rose at Langtry, Texas, in 1908 (No. 11612).

8. NEOPORTERIA gen. nov.

Plants globose to cylindric, sometimes much elongated and then sprawling or pendent over cliffs; more or less hairy at the crown; ribs usually straight, more or less tubercled; flowers from the center of the plant, short-funnelform, usually pinkish or reddish; stigma-lobes cream-colored to reddish; scales on the flower-tube bearing wool and long bristles in their axils; fruit as far as known small, more or less globular, dehiscing by a basal pore; seeds brown, somewhat wrinkled, tuberculate with a somewhat depressed hilum.

There are several species along the coast and mountains of Chile of which *Echinocactus subgibbosus* Haworth is selected as the type. In Schumann's keys one would look for these species in his subgenus *Notocactus* of *Echinocactus* but, as a matter of fact, most of them have been assigned to the subgenus *Hybocactus*. The group as treated here is a natural one and deserves separation as a genus. Doubtless, still other species will be assigned here when better known. From *Malacocarpus*, to which we have referred most of Schumann's species grouped by him in *Notocactus*, it differs in its fruit, seeds, and in the shape and color of the flowers.

The genus is named for Carlos Porter of Chile, a well-known entomologist. Seven species are described.

KEY TO SPECIES.

Spines all weak, often thread-like ..... 1. *N. nidus*
Spines stouter, the central, at least, subulate.
  Spines black.
    Spines puberulent; outer perianth-segments reddish ..... 2. *N. occulta*
    Spines glabrous; outer perianth-segments greenish ..... 3. *N. nigricans*
  Spines not black (or black when young in No. 7).
    Flowers pink.
      Plants bluish green; style and stigma-lobes reddish ..... 4. *N. jussieui*
      Plants bright green; style and stigma-lobes white to greenish.
        Perianth-segments entire ..... 5. *N. subgibbosa*
        Perianth-segments toothed ..... 6. *N. chilensis*
    Flowers not pink ..... 7. *N. fusca.*

1. Neoporteria nidus (Söhrens).

Echinocactus senilis Philippi, Gartenflora **35**: 485. 1886. Not Beaton, 1839.
Echinocactus nidus Söhrens in Schumann, Monatsschr. Kakteenk. **10**: 122. 1900.

Simple, somewhat glaucous, short-cylindric, 8 cm. long, 5 to 6 cm. in diameter, the top covered by the slender ascending connivent spines; ribs 16 to 18, obtuse, strongly tubercled; areoles large, circular; spines weak, numerous, sometimes 30 in a cluster, unequal, white, the longest 3 cm. long, bulbose at base; flowers rather slender, 4 cm. long, perhaps pinkish, but sometimes described as yellow; inner perianth-segments narrow, acute; scales on the flower-tube woolly and setose; fruit not known.

Type locality: East of Ovalle, Chile.
Distribution: Northern Chile.

Dr. Rose examined the type of *E. senilis* in the Philippi Herbarium in 1914 and it agrees with the first illustration cited below. He also saw a part of Mr. Söhrens's type of *Echinocactus nidus* at Santiago, Chile, in 1914. Its flowers were still unknown.

We have united *Echinocactus senilis* and *E. nidus*, using the later specific name since *E. senilis*, the older name, is a homonym. We have not seen living specimens, but we have two photographs sent us by Harvey Frank in 1905, labeled *E. senilis* and *E. nidus*, respectively, which are very much alike and led us to unite the two species. If two species are here involved, our description would apply to *E. senilis*.

Illustrations: Gartenflora **35**: pl. 1230, f. A, as *Echinocactus senilis;* Monatsschr. Kakteenk. **10**: 123, as *E. nidus*.

Figure 103 is copied from the first illustration above cited.

2. Neoporteria occulta (Philippi).

Echinocactus occultus Philippi, Fl. Atac. 23. 1860.

Plants globular to short-cylindric, 5 to 8 cm. high, somewhat depressed at apex; ribs about 14, obtuse, separated by acute intervals, strongly tubercled; tubercles somewhat rhombic in shape, with a chin at the base; areoles 1.5 cm. apart, rather narrow and depressed; spines wanting or when present 1 to 10, unequal, 1 to 4 cm. long, puberulent, blackish; flowers central, 2.5 cm. long but 5 cm. broad; outer perianth-segments spatulate, finely toothed near the apex; axils of the scales on the flower-tube bristly; scales on the ovary woolly in their axils.

Type locality: Seacoast from Copiapo to Cobre.

Distribution: Provinces of Copiapo and Antofagasta, Chile.

Schumann states that Philippi is not quite accurate in asserting that this species is found along the beach, but that it comes from the foot-hills.

Illustrations: Blühende Kakteen 1: pl. 24; Monatsschr. Kakteenk. 11: 92, 93; Schumann, Gesamtb. Kakteen Nachtr. f. 24, as *Echinocactus occultus*.

Figure 104 is copied from the first illustration above cited.

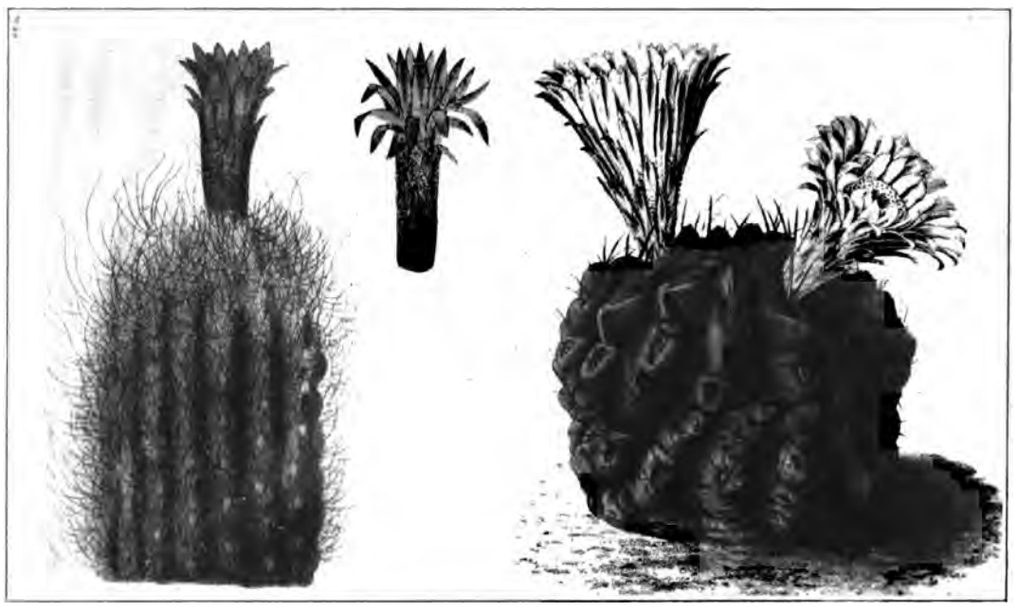


FIG. 103.—Neoporteria nidus.

FIG. 104.—Neoporteria occulta.

3. Neoporteria nigricans (Linke).

Echinopsis nigricans Linke, Allg. Gartenz. 25: 239. 1857.
Echinocactus nigricans Dietrich in Schumann, Gesamtb. Kakteen 420. 1898.

Simple, short-cylindric, somewhat narrow at base; ribs 15, strongly tuberculate, glaucous-green, compressed; radial spines 8 or 9, somewhat curved, 7 mm. long; central spines 1 or 2, 1.2 cm. long; flowers 4.5 to 5 cm. long, white or yellowish green; inner perianth-segments spreading, somewhat toothed above, acute; stigma-lobes reddish or purplish; scales on ovary and flower-tube acute, bearing a few hairs or bristles in their axils.

Type locality: Chile or Bolivia.

Distribution: West coast of South America, doubtless Chile.

According to Mr. Juan Söhrens, this plant is found in the mountains of northern Chile. We know it only from description and the single illustration cited below.

According to Schumann (Gesamtb. Kakteen 420. 1898), *Echinocactus cupreatus* Poselger (Förster, Handb. Cact. ed. 2. 602. 1885) is related to this species. He states that it is distinguished by the darker brown color and fewer spines of a brown-black color, lighter at the base.

Illustration: Blühende Kakteen 1: pl. 45, as *Echinocactus nigricans*.

Figure 105 is copied from the illustration above cited.

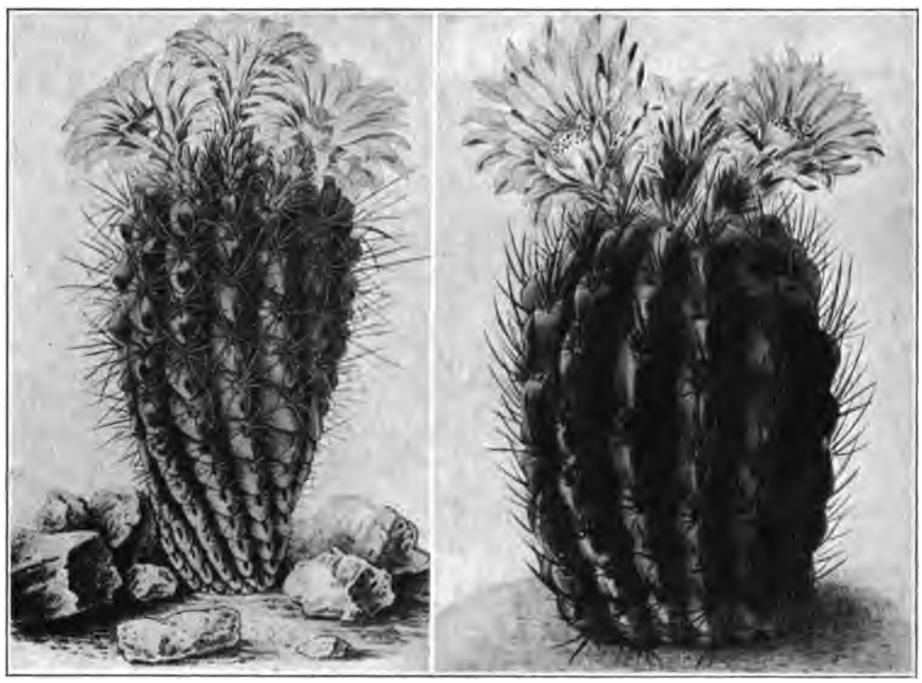


FIG. 105.—Neoporteria nigricans.

FIG. 106.—Neoporteria fusca.

4. Neoporteria jussieui (Monville).

Echinocactus jussieui Monville in Salm-Dyck, Cact. Hort. Dyck. 1849. 170. 1850.

Simple, globose or short-cylindric, dark or bluish green; ribs 13 to 16, rather stout, divided into prominent tubercles; radial spines 7 or perhaps more, dark brown, somewhat spreading; central spines 1 or 2, 2.5 cm. long; flowers from near the center of the plant, 3 to 3.5 cm. long; perianth-segments linear-oblong, acute, pinkish, but sometimes described as yellow; style and stigma-lobes reddish; ovary bearing scales and these woolly in their axils; fruit not known.

Type locality: Not cited.

Distribution: Chile.

Echinocactus niger (Salm-Dyck, Cact. Hort. Dyck. 1849. 34. 1850) and *E. jussianus* Lemaire (Labouret, Monogr. Cact. 247. 1853), undescribed, belong here. A variety, *cristatus* (Rümpler in Förster, Handb. Cact. ed. 2. 581. 1885), is described as having 18 to 20 ribs.

The original description of this species is very meager while recent descriptions are scarcely more satisfactory. Both Schumann and Weber describe the flowers as yellow, while Gürke in Blühende Kakteen illustrates them as pinkish. The illustration cited below suggests relationship with *E. subgibbosus*. The flowers of both are pinkish. So far as we know, *N. jussieui* never has bristles in the axils of the scales on the ovary, and this seems to be true of all the species of the genus.

The plant illustrated in the Monatsschrift für Kakteenkunde (27: 53, 1917) seems to be some species of *Malacocarpus*.

FIG. 107—Neoporteria jussieui. FIG. 108.—Neoporteria chilensis.

Illustrations: Blühende Kakteen **2**: pl. 67; (?) Monatsschr. Kakteenk. **27**: 53, as *Echinocactus jussieui*.

Figure 107 is copied from the first illustration above cited.

5. Neoporteria subgibbosa (Haworth).

Echinocactus subgibbosus Haworth, Phil. Mag. **10**: 419. 1831.
Cactus berteri Colla, Mem. Accad. Sci. Torino **37**: 77. 1833.
Echinocactus acutissimus Otto and Dietrich, Allg. Gartenz. **3**: 353. 1835.
Echinocactus exsculptus Otto in Pfeiffer, Enum. Cact. 65. 1837.
Cereus dichroacanthus Martius in Pfeiffer, Enum. Cact. 76. 1837.
Mammillaria atrata Hooker in Curtis's Bot. Mag. **65**: pl. 3642. 1839.
Mammillaria floribunda Hooker in Curtis's Bot. Mag. **65**: pl. 3647. 1839.
Echinocactus thrincogonus Lemaire, Cact. Gen. Nov. Sp. 22. 1839.
Echinocactus thrincogonus elatior Lemaire, Cact. Gen. Nov. Sp. 23. 1839.
Echinocactus berteri Remy in Gay, Fl. Chilena **3**: 15. 1847.
Echinocactus rostratus Jacobi, Allg. Gartenz. **24**: 108. 1856.
Cactus atratus Kuntze, Rev. Gen. Pl. **1**: 259. 1891.
Cactus floribundus Kuntze, Rev. Gen. Pl. **1**: 259. 1891.

Globose when young, soon cylindric, usually 3 dm. high and erect, but sometimes much elongated, a meter long or more, either prostrate or hanging over cliffs, very spiny; ribs numerous, often 20, 1 cm. high; areoles approximate, often large, sometimes 1 cm. in diameter; spines numerous, acicular, brownish in age, often paler at base, straight, the longest ones 3 cm. long; flowers usually abundant, 4 cm. long, the buds dark red, pointed; perianth-segments usually light pink, but sometimes darker, very numerous, the outer ones spreading, the central ones erect, concealing the stamens, acute; filaments attached below middle of flower-tube, erect, white, included; style slender, pale, slightly exserted; scales on ovary minute, acute, horny, those on tube hairy and bristly; fruit 1.5 to 2 cm. long, reddish; seeds brown, 1 mm. in diameter.

Type locality: Near Valparaiso, Chile.

Distribution: Along the seacoast of Chile, both north and south of Valparaiso.

Echinocactus exsculptus Otto, when first described, was a complex. Pfeiffer (Enum. Cact. 65. 1837) says it comes from Chile, Mexico, and Montevideo; he referred here several

synonyms; one of them is *Echinocactus subgibbosus* which Haworth states in his original description comes from Valparaiso. This is doubtless Pfeiffer's Chilean element of the species. Another synonym is *Cereus montevidensis* Pfeiffer (Enum. Cact. 65. 1837) which is the Montevideo element. Two other names, but not described until later, *E. acanthion* and *E. interruptus*, seem to represent the Mexican element. In the Addenda (181. 1837) he adds two synonyms, *E. crenatus* and *E. guyannensis*. In addition to this synonymy Pfeiffer described plants in the Berlin Botanical Garden, the origin of which was not stated.

Förster's treatment (Handb. Cact. 291. 1846) is still more complex. He gives the distribution: Mexico, Buenos Aires, Chile, and Brazil. With Brazil he includes Montevideo, Para, and Guiana. Here he refers as synonyms those given by Pfeiffer and adds: *Echinocactus valparaiso, Cereus hoffmannseggii, Mammillaria hoffmannseggii*, and *M. gibbosa* (Salm-Dyck, Hort. Dyck. 343. 1834). He also mentions or describes the following varieties: *fulvispinus, dichroacanthus* (Salm-Dyck, Cact. Hort. Dyck. 1844. 18. 1845; *Cereus dichroacanthus* Martius in Pfeiffer, Enum. Cact. 76. 1837), *foveolatus* (Salm-Dyck, Cact. Hort. Dyck. 1844. 18. 1845; *Cereus foveolatus* Haage jr. in Pfeiffer, Enum. Cact. 77. 1837), *tenuispinus* and *thrincogonus* (Förster, Handb. Cact. 293. 1846; *Echinocactus thrincogonus* Lemaire, Cact. Gen. Nov. Sp. 22. 1839).

Echinocactus pseudo-cereus Meinshausen (Wochenschr. Gärtn. Pflanz. 1: 29. 1858) is described from a barren plant supposed to have been grown from Mexican seed obtained by Karwinsky. If related to *Echinocactus exsculptus*, as stated by Meinshausen, it is more likely to have come from South America.

Echinocactus acutissimus cristatus (Förster, Handb. Cact. ed. 2. 567. 1885) probably belongs here.

Echinocactus exsculptus gayanus Monville (Labouret, Monogr. Cact. 241. 1853) and *Echinocactus gayanus* (Lemaire, Cact. Gen. Nov. Sp. 22. 1839) were never described.

Schumann has also referred here *Echinocactus hoffmannseggii* (Gesamtb. Kakteen 426. 1898). He would also refer here *Cactus berteri* Colla and *Echinocactus rostratus*, both of which were also based on Valparaiso plants.

Echinocactus exsculptus fulvispinus (Förster, Handb. Cact. 292. 1846) was supposed to be a form of the species proper, while the variety *elatior* (Förster, Handb. Cact. 293. 1846) was referred as a synonym of one of its varieties; *Echinocactus exsculptus cristatus* (Förster, Handb. Cact. ed. 2. 566. 1885) is only an abnormal form; *Echinocactus foveolatus* Haage (Salm-Dyck, Cact. Hort. Dyck. 1849. 33. 1850) was never described but doubtless belongs here.

Echinocactus gayanus intermedius Monville (Labouret, Monogr. Cact. 240. 1853) appeared as a synonym of *E. thrincogonus*.

Mammillaria ambigua G. Don (Loudon, Hort. Brit. 194. 1830), to which *Cactus ambiguus* Gillies was referred, seems never to have been described. Schumann did not know it, but thought that it was some *Echinocactus*. If it actually came from Chile, as reported, it may possibly be referable here. It may be the same as *Melocactus ambiguus* Pfeiffer, which, however, is usually referred to *Echinopsis leucantha*.

Of this relationship is the plant described and illustrated by Walton (Cact. Journ. 1: 105. 1898) as *Echinocactus rubidus superbissimus* which he states is native of Chile.

Illustrations: Mem. Accad. Sci. Torino 37: pl. 17, f. 2, as *Cactus berteri;* Loudon, Encycl. Pl. ed. 3. 1201. f. 17360; Curtis's Bot. Mag. 65: pl. 3642, as *Mammillaria atrata;* Pfeiffer and Otto, Abbild. Beschr. Cact. 1: pl. 20; Blühende Kakteen 3: pl. 133; Monatsschr. Kakteenk. 30: 139, as *Echinocactus acutissimus;* Curtis's Bot. Mag. 65: pl. 3647, as *Mammillaria floribunda;* Martius, Fl. Bras. 4^2: pl. 51, f. 1; Knippel, Kakteen pl. 7; Schelle, Handb. Kakteenk. 195. f. 128, as *Echinocactus exsculptus*.

Plate VIII, figure 4, shows the flowering top of a plant brought by Dr. Rose to the New York Botanical Garden from east of Las Vilas, Chile, in 1914.

6. Neoporteria chilensis (Hildmann).

Echinocactus chilensis Hildmann in Schumann, Gesamtb. Kakteen 423. 1898.

Simple or proliferous at base, globose to short-columnar, woolly at apex; ribs 20 or 21, crenate, pale green; radial spines about 20, somewhat acicular, 1 cm. long; central spines 6 to 8, 2 cm. long; flowers pink, 5 cm. broad when fully expanded; perianth-segments narrow, acute, the inner ones toothed toward the apex; filaments white, short; style white, with yellow stigma-lobes; the scales of the ovary and flower-tube bearing in their axils short wool and some of them a long white hair much longer than the scale.

Type locality: Chile.

Distribution: Western part of the Andes of Chile.

This species was originally described as having yellow flowers and naked scales but this was evidently an error.

E. chilensis confinis Hildmann (Schumann, Gesamtb. Kakteen 424. 1898) is said to differ from the species in its shorter yellow central spines.

Illustration: Blühende Kakteen 3: pl. 138, as *Echinocactus chilensis*.

Figure 108 is copied from the illustration above cited.

7. Neoporteria fusca (Mühlenpfordt).

Echinocactus fuscus Mühlenpfordt, Allg. Gartenz. 16: 10. 1848.
Echinocactus ebenacanthus Monville in Labouret, Monogr. Cact. 253. 1853.
Echinocactus humilis Rümpler in Förster, Handb. Cact. ed. 2. 471. 1885.

Globular to short-cylindric, about 10 cm. in diameter; ribs 12 or 13, dark green, somewhat tubercled; radial spines 5 to 7, more or less ascending, brownish; central spines 4, black when young, 3 cm. long; flowers 3 cm. long, described as yellow, certainly very pale and nearly white; scales on the flower-tube woolly and setose in their axils.

Type locality: Not cited.

Distribution: Andes of Chile.

Echinocactus hankeanus Förster (Handb. Cact. ed. 2. 471. 1885), referred here as a synonym by Schumann, was never described but first appeared as a synonym of *Echinocactus humilis*. The two varieties of *Echinocactus ebenacanthus, minor* and *intermedius*, were proposed by Labouret (Monogr. Cact. 254. 1853). To the former he referred as a synonym *Echinocactus ebenacanthus affinis* Cels.

Illustrations: Blühende Kakteen 1: pl. 51; Monatsschr. Kakteenk. 27: 135; Schelle, Handb. Kakteenk. 194. f. 127, as *Echinocactus ebenacanthus*.

Figure 106 is copied from the first illustration above cited.

DESCRIBED SPECIES, PERHAPS REFERABLE TO THIS GENUS.

ECHINOCACTUS CASTANEOIDES Cels in Salm-Dyck, Cact. Hort. Dyck. 1849. 165. 1850.

Simple, globose to short-columnar; ribs 15 to 20, tuberculate, light green; radial spines 18 to 20, acicular; central spines 6, larger than the radials; flowers very narrow, tubular.

Type locality: Not cited.

Distribution: Chile or Bolivia.

Schumann first placed this species near *Echinocactus acutissimus* and later referred it to a different section, placing it next to *Echinocactus clavatus*. He also says that it comes from Copiapo, Chile.

Mr. Söhrens sent a plant to Schumann, who called it *Echinocactus castaneoides*, but it was probably *E. acutissimus*.

ECHINOCACTUS KUNZEI* Förster, Handb. Cact. 293. 1846.

Spherical, sunken at top; ribs 16 to 21; spines bent upward, when young yellow, in age gray; radial spines 9 to 12; central spines 2 to 4, a little longer than the radials, 2.5 cm. long; flowers described as lateral, 6 to 8, 5.5 to 6 cm. long; scales of the ovary and flower-tube woolly and setose in their axils.

*Originally spelled *kunzii*.

Type locality: Chile.

Distribution: Mountain ridges in Chile.

In both the illustrations cited below the scales on the ovary and flower-tube are ovate and overlapping and are not shown as woolly or setose in their angles. Schumann, however, describes them as such and, if so, the species must be of this relationship.

Here we would refer the two varieties, *brevispinosus* Förster (Allg. Gartenz. **15**: 51. 1847) and *rigidior* Salm-Dyck (Cact. Hort. Dyck. 1849. 33. 1850).

Echinocactus neumannianus Labouret (Monogr. Cact. 245. 1853) is referred by Schumann as a synonym of this species. It comes from Copiapo, Chile, and may be a different species.

Echinocactus neumannianus rigidior (Salm-Dyck, Cact. Hort. Dyck. 1844. 18. 1845) is only a name.

Schumann also refers here *Echinocactus supertextus* Pfeiffer (Abbild. Beschr. Cact. **2**: under pl. 14. 1847), but the description reads more like that of *E. curvispinus*. This is the conclusion reached by Mr. Söhrens of Santiago. Specimens so named in the Philippi Herbarium we would certainly refer to *Neoporteria*.

The species was named for Dr. Gustave Kunze, at one time director of the Botanical Garden at Leipzig.

Illustrations: Förster, Handb. Cact. ed. 2. 571. f. 75; Gartenflora **31**: pl. 1082, a to c.

ECHINOCACTUS MALLETIANUS Lemaire, Allg. Gartenz. **13**: 387. 1845.

Stems simple, depressed-globose or somewhat cylindric, very woolly at the top, 1 dm. high; ribs 15 to 17, more or less; spines straight, acicular, black; radial spines 5 or 6, suberect; central spine solitary; flowers and fruit unknown.

Type locality: Not cited.

Dr. Rose obtained from L. Quehl a photograph of this species as it is now represented in collections. Its relationship is doubtful, but it should certainly not be placed just after *Echinocactus horizonthalonius* as it was by Schumann.

Illustration: Möllers Deutsche Gärt. Zeit. **25**: 474. f. 6, No. 16.

ECHINOCACTUS PEPINIANUS Schumann, Gesamtb. Kakteen 420. 1898.

This species is very different from the species so named by Lemaire. Its flowers and fruit are unknown and its relationship is not known to us. If it is from Chile or Peru, as Schumann suggests, it may be referable to one of the species of *Copiapoa*. For note on *Echinocactus pepinianus* Lemaire, see Britton and Rose (Cactaceae **2**: 137. 1920).

ECHINOCACTUS SUBNIGER Poselger in Förster, Handb. Cact. ed. 2. 588. 1885.

Simple, globose to short-columnar; ribs 16, grayish green; radial spines 8, 1.5 cm. long; central spines 1 to 3, 2 cm. long.

Type locality: Mexico.

This species is recognized by Schumann, but its flowers and fruit are unknown. It is impossible, without seeing a specimen, to make out its generic relationship. If it came from Mexico, as Rümpler thought, it does not belong to *Neoporteria*, but if it is from Chile, as Schumann believed, it should probably be placed there.

9. AREQUIPA gen. nov.

Either simple or cespitose, globular to short-cylindric, small cacti; ribs numerous, low, somewhat tubercled, very spiny; flowers central, funnelform, scarlet; ovary and flower-tube scaly; axils of scales long-hairy but not spiny nor bristly; fruit so far as known dry, dehiscing by a basal pore; seed black, pitted, with a broad basal hilum.

Type species: *Echinocactus leucotrichus* Philippi.

The genus as here treated consists of two species, one of which has heretofore appeared under several specific names, sometimes in *Echinocactus* and sometimes in *Echinopsis*, although it has little in common with either genus and, especially, as these genera are now

understood. *Arequipa* is characterized by its slender, elongated, scarlet flower. The species are confined to the mountains of Peru and northern Chile. The generic name is that of the city in Peru near which the type species is found in great abundance.

KEY TO SPECIES.

Hairs of flower-tube white; spines acicular..... 1. *A. leucotricha*
Hairs of flower-tube brown; spines bristly..... 2. *A. myriacantha*

1. Arequipa leucotricha (Philippi).

Echinocactus leucotrichus Philippi, Anal. Mus. Nac. Chile 1891[2]: 27. 1891.
Echinocactus clavatus Söhrens, Monatsschr. Kakteenk. 10: 27. 1900.
Echinopsis hempeliana Gürke, Monatsschr. Kakteenk. 16: 94. 1906.
Echinocactus reitigii Quehl, Monatsschr. Kakteenk. 29: 129. 1919.

Plants simple or cespitose, sometimes branching, globular or sometimes elongated (4 to 6 dm. long) and then often prostrate, usually covered with spines but naked below when very old; ribs 10 to 20, closely set, low; areoles close together; spines* 6 to 20, slender; central spines much longer than the radials, 2 to 3 cm. long; flowers 5 to 6 cm. long, with a long slender tube, scarlet; scales on ovary and flower-tube small, with long white hairs in their axils; fruit globular, 2 cm. in diameter.

Type locality: Naquira, Chile.

Distribution: Vicinity of Arequipa, southern Peru to northern Chile.

Dr. Rose found this species very common about Arequipa and for a long time he was unable to identify it. Its habit and dry fruit suggested some of the so-called species of *Echinocactus* but its slender red flower was not typical of that genus. It did not suggest the genus *Echinopsis* in any particular. A careful examination of the description of *Echinopsis hempeliana* Gürke and the cited illustration, however, points definitely to this Arequipa plant. The home of *E. hempeliana* was unknown to Gürke, but it is not unlikely that it was collected in southern Peru, perhaps at the time *Opuntia hempeliana* was found.

Here belongs doubtless the Arequipa plant mentioned by Schumann under *Echinopsis rhodacantha.*

After leaving Arequipa Dr. Rose went to Santiago, Chile, where he found in the herbarium of Dr. Philippi the type specimen of *Echinocactus leucotrichus* which has flowers almost identical with those of the Arequipa plant and we therefore adopt this specific name for the group. We have not seen specimens of *Echinocactus clavatus* but the illustration and description of the flowers point strongly to this species.

Echinocactus hempelianus Schumann (Monatsschr. Kakteenk. 15: 178. 1905) is only a mentioned name.

Illustrations: Blühende Kakteen 2: pl. 85, as *Echinopsis hempeliana;* Schumann, Gesamtb. Kakteen Nachtr. f. 17; Monatsschr. Kakteenk. 10: 25, as *Echinocactus clavatus.*

2. Arequipa myriacantha (Vaupel)

Echinocactus myriacanthus Vaupel, Bot. Jahrb. Engler 50: Beibl. 111: 25. 1913.

Simple, depressed-globose, 10 cm. in diameter, 8 cm. high; ribs 26, strongly tubercled, separated by an acute sinus; areoles closely set, broadly elliptic; spines slender, bristle-like, when young brown, in age dark gray, 25 or more, the longer ones 3 cm. long; flowers slender, tubular, 5 to 6 cm. long; axils of the scales on the flower-tube and ovary bearing long silky brown hairs.

Type locality: Above Balsas in the provinces of Chachapoyas, Department of Amazonas, Peru, altitude 2,200 meters.

Distribution: Northeastern Peru.

This species is related to *Arequipa leucotricha,* but it has very different armament.

Through the kindness of F. Vaupel we have been able to examine a fragment of the type of this species which was collected by A. Weberbauer (No. 4272) and is now preserved in the herbarium of the Botanical Garden at Berlin.

*In seedlings and even in small 5 to 6 year-old plants the spines are pilose.

10. **OROYA** gen. nov.

Plants solitary, depressed-globose, low-ribbed; areoles elongated, narrow; spines widely spreading; flowers central, borne at the upper edge of the spine-areole, red to pink, short-funnelform; tube-proper very short, naked; stamens inserted on the throat of the flower, included; scales on the ovary small, bearing small tufts of hair in their axils; fruit short, clavate, glabrous.

Type species: *Echinocactus peruvianus* Schumann.

The generic name is that of the village in Peru in which the type species is found.

1. Oroya peruviana (Schumann).

Echinocactus peruvianus Schumann, Gesamtb. Kakteen Nachtr. 113. 1903.

Depressed and deep-seated in the ground, 10 to 14 cm. broad; ribs usually 21, low, obtuse, divided into low tubercles; areoles 8 to 12 mm. long; radial spines 18 to 20, yellowish with darker bases and reddish tips, unequal, the longer ones about 2 cm. long; central spines sometimes as many as 4, but often wanting, a little longer and stouter than the laterals and usually red in color; flowers 1.5 to 2 cm. long; outer perianth-segments acute, reddish, the inner pink, yellow at base, linear, obtuse or apiculate; style pink above; stigma-lobes pale yellow; seeds 2 mm. long, black.

Type locality: High mountains above Lima, Peru.

Distribution: High Andes of central Peru.

In 1914 Dr. Rose found this plant growing abundantly in the vicinity of Oroya, Peru, on a gravelly flat. The individual plants show only their flat tops above the surface of the soil. *Opuntia floccosa* was also common in the same locality.

Illustrations: Blühende Kakteen **2**: pl. 88; Monatsschr. Kakteenk. **15**: 191, as *Echinocactus peruvianus*.

DESCRIBED SPECIES, PERHAPS OF THIS GENUS.

ECHINOCACTUS AURANTIACUS Vaupel, Bot. Jahrb. Engler **50**: Beibl. **111**: 23. 1913.

Simple or cespitose, subglobose; ribs about 16; areoles elliptic; spines about 25, reddish brown, unequal, about 16, spreading, about 1 cm. long, somewhat more radial than the others; the subcentral one of them 5 cm. long; flowers narrowly funnelform, 7 cm. long; fruit 1 cm. in diameter, covered with small lanceolate scales; seeds black.

Type locality: San Pablo, department of Catamarca, Peru.

Distribution: Peru.

11. **MATUCANA** gen. nov.

Usually simple, small and globular, rarely elongated; ribs numerous, broad, low, somewhat tubercled; areoles approximate, very woolly when young, with numerous acicular or bristly spines; flower slender, tubular, scarlet, with a narrow limb; scales on the ovary and flower-tube scattered, naked in their axils; fruit not known.

Type species: *Echinocactus haynei* Otto.

The genus as known to us consists of one species, confined to the high mountains of central Peru. The generic name is that of the small village in central Peru near which the type species grows.

1. Matucana haynei (Otto).

Echinocactus haynii Otto in Salm-Dyck, Cact. Hort. Dyck. 1849. 165. 1850.
Cereus hayni Croucher, Garden **13**: 290. 1878.

Stems generally single, usually globular but sometimes short-cylindric, normally 8 to 10 cm. in diameter but in cultivation sometimes 30 cm. high, densely covered and nearly concealed under the numerous spines; ribs 25 or more, tuberculate; areoles set closely together, with an abundance of wool when young, but without any when old; spines numerous, long and weak, the stouter ones pungent, up to 3.5 cm. long, usually gray with dark or blackish tips; flower with a long slender tube, 6 to 7 cm. long; stigma-lobes green; scales on ovary and tube few, small, ovate.

Type locality: Obrajillo, Peru, but not cited in the original place of publication.

Distribution: Central Peru.

Dr. Rose found this species fairly common among rocks just below Matucana, Peru. Its long, slender, scarlet flowers make it a very desirable plant for cultivation. This species was collected in abundance by Dr. Rose in 1914 but it has not yet flowered in cultivation, although it was flowering when collected. The original spelling of the specific name was *haynii*, named, according to Rümpler, for Friedrich Gottlieb Hayne, a professor of botany in Berlin, who was born in 1832. Schumann in his Monograph wrote the name *Echinocactus haynei* and we have adopted his spelling.

In color, shape, and size, the flowers resemble those of species of *Borzicactus* (Cactaceae 2: 159); these, however, have the axils of scales on the corolla-tube hairy or woolly.

Echinocactus heynei (Monatsschr. Kakteenk. 20: 190. 1910) was never described. It may be simply a misspelling for *E. haynei*.

We have referred here the illustration from the Garden because it is made from the same cut as the four other illustrations cited below. It is there described, however, as a foot high with white flowers!

Illustrations: Dict. Gard. Nicholson 1: f. 689; Cact. Journ. 1: 181; Watson, Cact. Cult. 103. f. 35; ed. 3. 54. f. 24, as *Echinocactus haynei;* Garden 13: 291, as *Cereus hayni.*

Figure 109 is from a photograph of a plant collected by Dr. and Mrs. Rose at Matucana, Peru, in 1914 (No. 18651).

FIG. 109—Matucana haynei.

DESCRIBED SPECIES, PERHAPS OF THIS GENUS.

ECHINOCACTUS VILLOSUS (Monville) Labouret, Monogr. Cact. 239. 1853.

Cactus villosus Monville, Hort. Univ. 1: 223. 1839.
Echinocactus polyrhaphis Pfeiffer in Förster, Handb. Cact. 297. 1846.
Echinocactus villosus crenatior Monville in Labouret, Monogr. Cact. 240. 1853.

Simple, subglobose or short-columnar, somewhat depressed; ribs 13 to 15, somewhat tuberculate, subcompressed, glaucous-green or somewhat violet or even blackish; radial spines 12 to 16, setaceous to subulate; central spines usually 4, 3 cm. long; flowers rose-colored without, white within; scales of the ovary and flower-tube naked in their axils.

Type locality: Not cited.

Distribution: Chile (*fide* Schumann); Lima, Peru (*fide* Labouret).

This species is said to resemble *Echinocactus acutissimus* but is described by Schumann as having naked scales and the axils of the scales also naked. If it came from near Lima, Peru, as is usually stated, it is probably *Echinocactus haynei.* Söhrens claims it is from Huasco, Chile.

Gymnocalycium villosum Pfeiffer is given by Förster (Handb. Cact. 297. 1846) as a synonym of *E. polyrhaphis. E. polyrhaphis* is written *polygrhaphis* by Labouret and *polyraphis* by Salm-Dyck.

Illustration: Möllers Deutsche Gärt. Zeit. 25: 474. f. 6, No. 26.

ECHINOCACTUS WEBERBAUERI Vaupel, Bot. Jahrb. Engler 50: Beibl. 111: 26. 1913.

Depressed, 10 cm. broad, 7 cm. high; ribs 21, divided into terete tubercles; areoles rather close together, broadly elliptic; spines about 30, the longer ones 3.5 cm. long, straight; flowers tubular,

5.5. cm. long; ovary and flower-tube bearing lanceolate acute scales, these without hairs in their axils.

Type locality: Above Balsas in the department of Amazonas, Peru.

Distribution: Northeastern Peru.

Through the kindness of F. Vaupel we have been able to study a fragment of this very interesting species. It much resembles *Matucana haynei*.

12. HAMATOCACTUS gen. nov.

Globose to short-cylindric, of flabby texture like an *Echinocereus*, distinctly ribbed, the ribs more or less spiraled; areoles circular; spines radial and central, one of them usually hooked; flower-bud pointed, covered with imbricating scales; flower-tube narrow, funnelform; limb broad; scales on the ovary few, fugacious, small, naked in their axils; fruit small, globular, red, dehiscing by a basal pore; seeds black, tuberculate; hilum large, basal, circular; embryo straight; cotyledons short and thick.

Echinocactus setispinus Engelmann, the only species here recognized, is the type.

Although this plant heretofore always passed as an *Echinocactus* its anomalous characters have been recognized, such as the texture of the fleshy stem, the fruit, and the seeds; Engelmann in his Synopsis of the Cactaceae thus spoke of it: "The compressed ribs, setaceous spines, small red berry, and tuberculated seeds easily distinguish it from all its allies."

The generic name is from *hamatus* hooked, and *cactus*, referring to the hooked central spine.

FIGS. 110 and 111.—Fruit and flower of Hamatocactus setispinus. ×0.8.

FIG. 112.—Hamatocactus setispinus.

1. Hamatocactus setispinus (Engelmann).

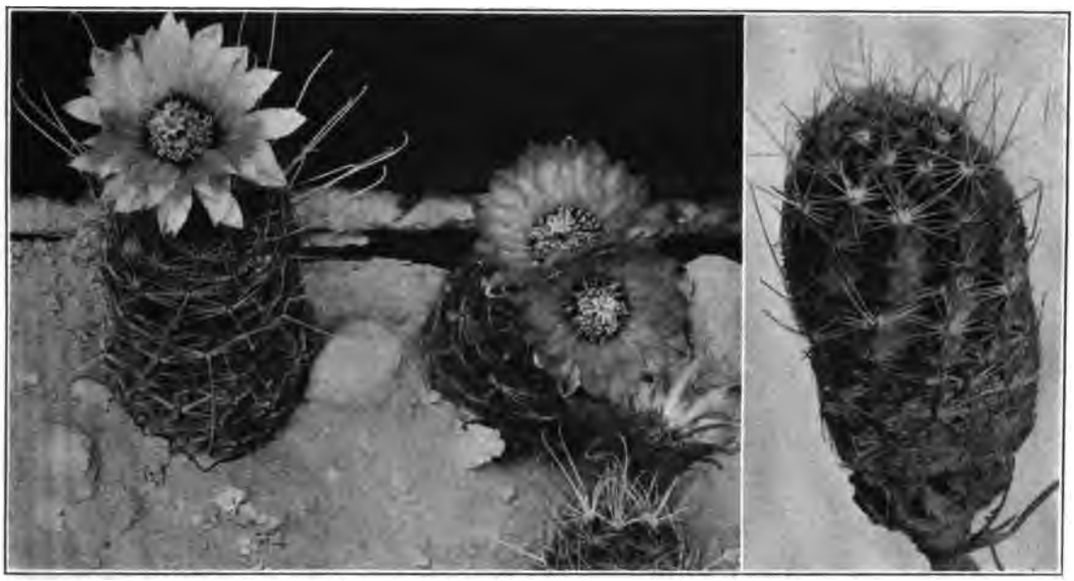
Echinocactus setispinus Engelmann, Bost. Journ. Nat. Hist. **5**: 246. 1845.
Echinocactus muehlenpfordtii Fennel, Allg. Gartenz. **15**: 65. 1847.
Echinocactus hamatus Mühlenpfordt, Allg. Gartenz. **16**: 18. 1848. Not Forbes, 1837.
Echinocactns setispinus hamatus Engelmann, Bost. Journ. Nat. Hist. **6**: 201. 1850.
Echinocactus setispinus setaceus Engelmann, Bost. Journ. Nat. Hist. **6**: 201. 1850.
Echinocactus setispinus cachetianus Labouret, Monogr. Cact. 203. 1853.
Echinocactus hamulosus Regel, Ind. Sem. Hort. Petrop. 34. 1856.

Echinopsis nodosa Linke, Wochenschr. Gärtn. Pflanz. 1: 85. 1858.
Echinocactus nodosus Hemsley, Biol. Centr. Amer. Bot. 1: 535. 1880.
Echinocactus setispinus muhlenpfordtii Coulter, Contr. U. S. Nat. Herb. 3: 370. 1896.
Echinocactus setispinus mierensis Schumann, Gesamtb. Kakteen 340. 1898.
Echinocactus setispinus orcuttii Schumann, Gesamtb. Kakteen 340. 1898.

Plants up to 15 cm. high, with long fibrous roots; ribs usually 13, more or less oblique, thin, high, undulate on the margin; radial spines 12 to 16, slender, often 4 cm. long, some white, others brownish; central spines 1 to 3, longer than radials; flower 4 to 7 cm. long, yellow, with a red center; inner perianth-segments oblong, acute, widely spreading; fruit 8 mm. in diameter, nearly naked; seeds 1.2 to 1.6 mm. in diameter.

Type locality: Thickets along the Colorado River, Texas.
Distribution: Southern Texas and northern Mexico.

Two species or very distinct forms pass under *E. setispinus;* both are common about Brownsville, Texas, and some very fine plants and photographs have recently been sent us by Mr. Robert Runyon. He believes that they are distinct species and the extreme forms are certainly very different. The two forms, however, grow at the same locality



FIGS. 113 and 114.—Hamatocactus setispinus.

under the same conditions and so far as we know have the same flowers and fruits. Engelmann, too, had noted the differences and gave them the varietal names, *hamatus* and *setaceus*. It will require still further field work before we can reach a definite conclusion regarding the limits of this species.

According to Engelmann (Cact. Mex. Bound. 21), this species was sent to him by Berlandier as *Cactus bicolor* and Schumann refers to it as *Echinocactus bicolor* Berlandier (Gesamtb. Kakteen 339. 1898). It is, however, very different from *Cactus bicolor* Berlandier (Mem. Comm. Limites 1. 1832).

Echinocactus cachetianus (Labouret, Monogr. Cact. 202. 1853), although not described in the place cited, is probably to be referred here. It is described, however, in Garten-Zeitung (4: 173. 1885). *E. cachetianus orcuttii* is given as a synonym of *E. setispinus orcuttii* by Schelle (Handb. Kakteenk. 159. 1907). At the same place Schelle lists the variety *E. setispinus martelii* Garde frèr. *Echinocactus marisianus* Galeotti, a manuscript name, is referred here by Schumann (Gesamtb. Kakteen 339. 1898).

Illustrations: Cact. Journ. 1: pl. for March; 181; Wiener Ill. Gart. Zeit. 29: f. 22, No. 4; Monatsschr. Kakteenk. 8: 131; 15: 73; Förster, Handb. Cact. ed. 2. 522. f. 65; 523. f. 66; Cact. Mex. Bound. pl. 20; Meehan's Monthly 9: pl. 6; Möllers Deutsche Gärt. Zeit. 25: 474. f. 6, No. 23; Schumann, Gesamtb. Kakteen f. 59; Schelle, Handb. Kakteenk. 158. f. 87, as *Echinocactus setispinus;* Monatsschr. Kakteenk. 1: pl. 9; Gartenwelt 9: 266, as *Echinocactus cachetianus;* Möllers Deutsche Gärt. Zeit. 25: 474. f. 6, No. 29, as *Echinocactus setispinus longispinus.*

Figures 110 and 111 show a flower and fruit copied from plate 20 of Cactaceae of the Mexican Boundary; figures 112 and 113 are from photographs made by Robert Runyon at Brownsville, Texas; figure 114 is from a photograph of a plant sent from Brownsville by Robert Runyon.

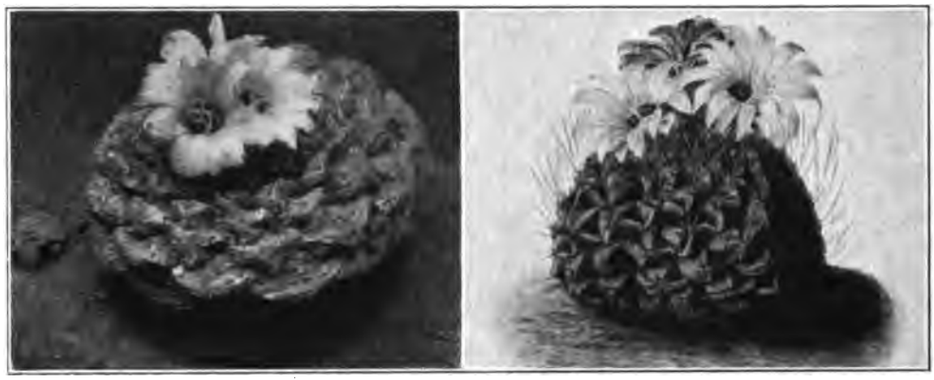
13. **STROMBOCACTUS** gen. nov.

A low, depressed, nearly spineless cactus, with imbricated chartaceous scale-like tubercles; flowers small, central, subcampanulate, nearly white; scales on the flower-tube with thin papery margins; scales on the ovary only near the top, small; fruit nearly naked; seeds small.

Type species: *Mammillaria disciformis* De Candolle.

One species is known, native of Mexico.

The generic name is from στρόμβος top, and κάκτος cactus, referring to the shape of the plant.



FIGS. 115 and 116.—Strombocactus disciformis.

1. Strombocactus disciformis (De Candolle).

Mammillaria disciformis De Candolle, Mém. Mus. Hist. Nat. Paris 17: 114. 1828.
Echinocactus turbiniformis Pfeiffer, Allg. Gartenz. 6: 275. 1838.
Echinofossulocactus turbiniformis Lawrence in Loudon, Gard. Mag. 17: 318. 1841.
Mammillaria turbinata Hooker in Curtis's Bot. Mag. 69: pl. 3984. 1843.
Cactus disciformis Kuntze, Rev. Gen. Pl. 1: 260. 1891.
Cactus turbinatus Kuntze, Rev. Gen. Pl. 1: 261. 1891.
Anhalonium turbiniforme Weber, Dict. Hort. Bois 90. 1893.
Echinocactus disciformis Schumann in Engler and Prantl, Pflanzenfam. 3^{6a}: 189. 1894.

Plants small, depressed, turbinate or semi-globose, 5 to 6 cm. broad; tubercles somewhat chartaceous, imbricate, more or less winged, bearing 1 to 4, white, acicular spines when young, naked when old; young areoles with white wool, naked in age; flowers from center of plant, 2 cm. long or less; scales and outer perianth-segments dark red, with whitish margins; inner perianth-segments white, lanceolate, acute, spreading; filaments much shorter than the inner perianth-segments, purple; stigma-lobes about 7, long, twisted; ovary naked except at the top, small; fruit 7 mm. long; seeds 3 mm. in diameter.

Type locality: Mineral del Monte, Mexico.
Distribution: Central Mexico.

This plant was collected by Dr. Rose in the state of Querétaro, Mexico, in 1905, and has repeatedly flowered each spring since 1906. It is called pellote or peyote in Mexico.

Echinocactus helianthodiscus Lemaire (Salm-Dyck, Cact. Hort. Dyck. 1844. 17. 1845), given as a synonym of *Echinocactus turbiniformis*, was never described.

Illustrations: Blühende Kakteen 1: pl. 39, *a*; Schumann, Gesamtb. Kakteen f. 77; Monatsschr. Kakteenk. 5: 119; 12: 91; Pfeiffer, Abbild. Beschr. Cact. 2: pl. 3; Schelle, Handb. Kakteenk. 203. f. 136, as *Echinocactus turbiniformis;* Curtis's Bot. Mag. 69: pl. 3984, as *Mammillaria turbinata.*

Figure 115 is from a photograph of a plant collected by Dr. Rose at Higuerillas, Querétaro, Mexico, in 1905; figure 116 is copied from the plate in the Blühende Kakteen cited above.

FIG. 117.—Leuchtenbergia principis.

14. **LEUCHTENBERGIA** Hooker in Curtis's Bot. Mag. 74: pl. 4393. 1848.

A low, simple or cespitose cactus, with a thickened woody base; tubercles finger-like, slender, much elongated, arranged in indefinite spirals; areoles on the ends of the tubercles; spines several, weak, often papery; flowers from near the center of the plant, large, yellow, funnelform-campanulate; scales on the ovary few, broad, naked in their axils; fruit probably dehiscing by a basal pore.

Type species: *Leuchtenbergia principis* Hooker.

The genus contains but one species; both genus and species were named for Eugene de Bauharnais, Duke of Leuchtenberg and Prince of Eichstädt, a French soldier and statesman (1781–1824). The generic name is usually credited to Hooker and Fischer,

but a careful examination of the early literature indicates that the plant was first described by Sir William Hooker in 1848 who says, "I willingly adopt a name by which the plant is known on the continent." In 1850 it is described by Fischer as his own genus.

This genus is closely related to *Echinocactus* and its segregates, having very similar flowers and fruits, but in its elongated angled tubercles it looks very unlike any of them. Engelmann suggested, although he never saw the fruit, that it might be a subgenus of *Mammillaria*.

1. Leuchtenbergia principis Hooker in Curtis's Bot. Mag. **74**: pl. 4393. 1848.

Plants up to 5 dm. high, 5 to 7 cm. in diameter, with a large simple or branched tap-root, often 12 cm. long; tubercles erect, ascending or widely spreading, very woolly in their axils, bluish green, 10 to 12.5 cm. long, more or less 3-angled, nearly truncate at apex, gradually dying off below and leaving broad scars on the trunk; spines papery, thin; radial spines 8 to 14, about 5 cm. long; central spines 1 or 2, sometimes 10 cm. long; flowers lasting for several days, fragrant, solitary, from just below the tips of the young tubercles, more or less funnelform, the limb when widely expanded 10 cm. broad; outer perianth-segments reddish with a brown stripe down the middle; inner perianth-segments oblong, acute, serrate at apex; stamens and style somewhat exserted; stigma-lobes 9 to 12, linear; fruit probably dry; seeds dark brown, minutely tuberculate.

FIG. 117 *a*.—Leuchtenbergia principis.

Type locality: Real del Monte (not Rio del Monte), Hidalgo, Mexico.

Distribution: Central to northern Mexico.

Hooker's plant came from Real del Monte, Hidalgo, where it was obtained by John Taylor. This is the only locality cited by Hemsley in the Biologia. It has been reported from the states of San Luis Potosí, Guanajuato, Zacatecas, and Coahuila. This is a wide distribution for the species. We have never seen plants from near the type locality.

In appearance this plant is very unlike any of the other cacti. Hooker speaks of its resemblance to some aloid plant with stems like those of some cycads. It is said to be used by the Mexicans as a medicine.

The plant was called by Hooker noble leuchtenbergia and also agave cactus.

Dr. C. A. Purpus writes that he found this plant in slate and lime formation in the Sierra de la Parras near Parras, Coahuila, and still more abundant in the Sierra de la Paila, also in Coahuila. This last station is a very inaccessible desert mountain range, almost

without water; vegetation is here very scanty. This species is associated with other cacti and with *Agave lophantha*, which it resembles in its habit more than it does that of its own relatives.

Illustrations: Palmer, Cult. Cact. 125; Curtis's Bot. Mag. **74**: pl. 4393; Cact. Journ. **1**: 149; Dict. Gard. Nicholson Suppl. f. 515; Ann. Rep. Smiths. Inst. **1908**: f. 23; Krook, Handb. Cact. 30; Monatsschr. Kakteenk. **4**: 9; Schumann, Gesamtb. Kakteen f. 5, 78; Förster, Handb. Cact. ed. 2. f. 77; Engler and Prantl, Pflanzenfam. 3^{6a}: f. 66; Cycl. Amer. Hort. Bailey **2**: f. 1269; Amer. Gard. **11**: 464; Schelle, Handb. Kakteenk. f. 137; Möllers, Deutsche Gärt. Zeit. **25**: 477. f. 11, No. 5; **29**: 90. f. 12; 91. f. 13; Garten-Zeitung **4**: 182. f. 42, No. 9; 286. f. 66; Gard. Chron. **1873**: 1116. f. 240; III. **29**: f. 63; Belg. Hort. **5**: pl. 40; Stand. Cycl. Hort. Bailey **2**: 610. f. 720; **4**: f. 2139; Blühende Kakteen **3**: pl. 158; Rümpler, Sukkulenten 192. f. 108; Goebel, Pflanz. Schild. **1**: pl. 2, f. 1; Gartenwelt **5**: 110; Watson, Cact. Cult. 186. f. 74; ed. 3. f. 51; Thomas, Zimmerkultur Kakteen 44; Remark, Kakteenfreund 21.

Figure 117 is copied from plate 4393 of the Botanical Magazine; figure 117*a* is from a photograph of a plant sent by Dr. Elswood Chaffey from Zacatecas, Mexico, in 1910.

15. ECHINOFOSSULOCACTUS Lawrence in Loudon, Gard. Mag. **17**: 317. 1841.

Mostly rather small plants, rarely over 10 cm. in diameter, but generally much smaller, usually solitary, rarely clustered, deep-seated in the ground, globular or depressed, or very old plants becoming short-cylindric; ribs usually numerous, in one species as few as 10, in others 50 to 100, usually very thin, more or less wavy; areoles on each rib sometimes only 1 or 2, always felted when young; spines in numerous clusters often covering the plant, some of them strongly flattened and ribbon-like; flowers small, campanulate to subrotate with a very short tube; stamens numerous, shorter than the perianth-segments; scales on the perianth and ovary few to numerous, scarious, naked in their axils; fruit globular to short-oblong, bearing a few papery scales, these perhaps deciduous in age; seeds black with a broad basal truncated hilum.

About 22 species, all native of Mexico, are here recognized, although more than three times as many species of this relationship have been described in *Echinocactus*. From our field observations the number of species must be larger than here recognized, but the herbarium material is so scanty and the species already described are so many that for the present we have contented ourselves chiefly in describing those which have been illustrated or are represented by preserved material.

Although this genus appears to be very distinct, the species are so little known that we can give only a few of the characters. In the case of one plant which recently fruited in the New York Botanical Garden the fruit splits down one side as in *Pediocactus*. This may be a common character in the genus and should be looked for whenever possible.

This genus was established by George Lawrence, gardener to the Rev. Theodore Williams at Hendon Vicarage, Middlesex, England, but so far has been overlooked by catalogues. We came upon it while looking through Loudon's Magazine of Gardening for new cactus names. Its publication, however, had been observed and noted by that keen bibliophile, James Britten (Journ. Bot. **54**: 338. 1916).

Lawrence numbers 35 species and varieties, most of which are named and briefly described. The genus as he defines it is not a very natural one. He arranges the species in three sections and each section is divided into two subsections.

His first section, *Gladiatores*, corresponds to Schumann's subgenus *Stenocactus* of the genus *Echinocactus* and represents *Echinofossulocactus* in our treatment, with *Echinocactus coptonogonus* Lemaire as its type.

The species belonging to his second section (*Latispineae*) and to his third section are referred elsewhere as synonyms, except the following which we are not able to associate with any of the names of *Echinocactus: E. harrisii* and *E. ignotus-venosus*.

Schumann described the group briefly, as follows:

"Ribs mostly moderately high, laterally compressed, almost like cardboard, very many (*E. coptonogonus* with only 13 to 15); flowers small, like a *Mammillaria* flower; ovary with scales and glabrous."

KEY TO SPECIES.

Ribs thick at base, triangular in cross-section.
- Ribs 10 to 14 ..... 1. *E. coptonogonus*
- Ribs about 35 ..... 2. *E. hastatus*

Ribs always numerous, very thin even at base.
- Ribs 100 or more ..... 3. *E. multicostatus*
- Ribs 25 to 55.
  - Some or all of radial spines acicular or setaceous.
    - Radial spines all acicular, white, straight.
      - Flowers greenish yellow.
        - Central spines terete ..... 4. *E. wippermannii*
        - Central spines narrow, but flattened ..... 5. *E. heteracanthus*
      - Flowers not greenish yellow.
        - Central spines 4 ..... 6. *E. albatus*
        - Central spines 3.
          - Central spines annulate; apex of plant not depressed ..... 7. *E. lloydii*
          - Central spines not annulate; apex of plant umbilicate ..... 8. *E. zacatecasensis*
    - Upper radial spines subulate, some flattened.
      - Spines yellow or white.
        - Spines only 5 or 6 ..... 9. *E. lamellosus*
        - Spines 8 to 11 ..... 10. *E. grandicornis*
      - Central and upper spines brownish ..... 11. *E. arrigens*
  - None of the spines acicular.
    - Perianth-segments rather short.
      - All spines appressed against plant ..... 12. *E. violaciflorus*
      - Some spines erect or porrect.
        - Ribs about 25.
          - Four upper spines much elongated ..... 13. *E. obvallatus*
          - Spines all somewhat similar.
            - Spines only 5 ..... 14. *E. pentacanthus*
            - Spines 10 or more ..... 15. *E. crispatus*
        - Ribs 30 or more.
          - Radial spines white ..... 16. *E. dichroacanthus*
          - Radial spines brown.
            - Flowers purplish ..... 17. *E. anfractuosus*
            - Flowers yellow.
              - Upper and flattened spines 3, rather short, red ..... 18. *E. tricuspidatus*
              - Upper and flattened spines usually 1, rarely 2 ..... 19. *E. phyllacanthus*
    - Perianth-segments much elongated and widely spreading or recurved ..... 20. *E. lancifer*

Species not grouped ..... 21. *E. gladiatus*; 22. *E. confusus*

1. Echinofossulocactus coptonogonus (Lemaire) Lawrence in Loudon, Gard. Mag. 17: 317. 1841.

Echinocactus coptonogonus Lemaire, Cact. Aliq. Nov. 23. 1838.
Echinocactus coptonogonus major Lemaire, Cact. Gen. Nov. Sp. 87. 1839.
Echinofossulocactus coptonogonus major Lawrence in Loudon, Gard. Mag. 17: 317. 1841.

Simple or perhaps cespitose, globular or a little depressed, 7 to 10 cm. high, glaucous-green; ribs stout, 1.5 cm. high, 10 to 14, acute; areoles about 2 cm. apart, when young abundantly floccose, but in age naked; spines 3 to 5, stout, a little incurved, the longest 3 cm. long, flattened; flowers 3 cm. long, 4 cm. broad; inner perianth-segments numerous, linear-oblong, acute, purple with white margins; ovary brownish violet, bearing thin scales.

Type locality: Mexico.

Distribution: Mexico, near San Luis Potosí and Pachuca, according to Schumann; the plant found at the latter locality is probably to be referred elsewhere.

This species is very abundant about San Luis Potosí from which place we have received considerable material from Orcutt and Palmer. It does not do well in cultivation. Only one plant is now alive in our collection and this has never flowered.

Echinocactus interruptus Scheidweiler (Cact. Hort. Dyck. 1849. 29. 1850) was referred here but never published. It was also used by Pfeiffer (Enum. Cact. 65. 1837) as a synonym of *E. exsculptus*.

Illustrations: Pfeiffer, Abbild. Beschr. Cact. 2: pl. 19; Blühende Kakteen 1: pl. 28; Dict. Gard. Nicholson 4: 538. f. 18; Suppl. f. 353; Förster, Handb. Cact. ed. 2. 527. f. 67; Lemaire, Icon. Cact. pl. 7; Schelle, Handb. Kakteenk. 168. f. 99; Watson, Cact. Cult. 95. f. 30, as *Echinocactus coptonogonus.*

2. Echinofossulocactus hastatus (Hopffer).

Echinocactus hastatus Hopffer in Schumann, Gesamtb. Kakteen 376. 1898.

Simple, depressed-globose, 10 cm. high, 12 cm. in diameter; ribs 35, triangular in section, light green, somewhat crenate; radial spines 5 or 6, very short, straight, yellow, the upper ones flattened, often 3 cm. long; central spine solitary, 4 cm. long, porrect; flowers white (the largest in this genus); fruit becoming dry; seeds obovate, 1.5 mm. long, brownish gray, shining, finely punctate.

Type locality: Mexico.

Distribution: Mexico, Hidalgo, north of Pachuca.

This species and its variety *fulvispinus* Allardt were only mentioned by Förster (Handb. Cact. 315. 1846). We know this species only from description.

3. Echinofossulocactus multicostatus (Hildmann).

Echinocactus multicostatus Hildmann in Mathsson, Gartenflora 39: 465. 1890.

Simple, usually globose, but sometimes depressed, 6 to 10 cm. in diameter; ribs 100 or more, very thin, wavy, each bearing only a few areoles; areoles pubescent when young; spines usually 6 to 9, divided into two classes, the 3 upper spines elongated, 4 to 8 cm. long, erect or ascending, flexible, rather thin but not very broad, yellowish to brownish; lower spines spreading, weak-subulate, 5 to 15 mm. long; flowers 2.5 cm. long; outer perianth-segments oblong, acuminate; inner perianth-segments oblong, acute or obtuse; scales on the flower-tube oblong, acuminate; scales on the ovary broadly ovate, acute to acuminate, very thin, more or less papery, early deciduous.

Type locality: Mexico.

Distribution: Eastern part of Mexico.

According to Schumann, this species was collected by Mathsson at Saltillo, Mexico, and this place is doubtless the type locality for the species. Here, fine specimens were collected by Dr. Edward Palmer in 1905 and by W. E. Safford in 1907, both in flower, so we are now able to describe the flowers.

Illustrations: Schumann, Gesamtb. Kakteen f. 64; Ann. Rep. Smiths. Inst. 1908: pl. 4, f. 3; Schelle, Handb. Kakteenk. 175. f. 104, 105, as *Echinocactus multicostatus.*

4. Echinofossulocactus wippermannii (Mühlenpfordt).

Echinocactus wippermannii Mühlenpfordt, Allg. Gartenz. 14: 370. 1846.

Simple, obovoid, 15 cm. high, 5 to 6 cm. in diameter, dull green; ribs 35 to 40, compressed, slightly undulate; areoles 12 mm. apart, hairy when young, glabrate in age; radial spines 18 to 22, setaceous, white, 15 mm. long; central spines 3 or 4, erect, elongated, 2 to 5 cm. long, subulate, terete, blackish; flowers 1.5 mm. long, dull yellow.

Type locality: Mexico.

Distribution: Hidalgo, Mexico.

We know this species only from description. Schumann states that both Ehrenberg and Mathsson collected it in the state of Hidalgo, but the species collected there by Dr. Rose, while of this relationship, is certainly distinct (Rose, No. 8717, in part).

Schumann refers here *Echinocactus acifer spinosus* Wegener (Linnaea 19: 355. 1847), an unpublished variety, which is the same as *Echinocactus spinosus* Wegener (Allg. Gartenz. 12: 66. 1844). This name is older, and if the same as *E. wippermannii* it would replace it; *E. acifer* Hopffer (Förster, Handb. Cact. 520. 1846) is said to belong here according to Labouret.

Illustrations: Schelle, Handb. Kakteenk. 169. f. 100; Möllers Deutsche Gärt. Zeit. 25: 474. f. 6, No. 12, as *Echinocactus wippermannii.*

5. Echinofossulocactus heteracanthus (Mühlenpfordt).

Echinocactus heteracanthus Mühlenpfordt, Allg. Gartenz. 13: 345. 1845.
Echinocactus tetraxiphus Otto in Schumann, Gesamtb. Kakteen 363. 1898.

Globose to short-cylindric, light green, nearly hidden by the closely set spines; ribs 30 to 34, much compressed, somewhat undulate; areoles white, hairy when young; radial spines 11 to 13 (16 to 18, according to Schumann), acicular, white, spreading; central spines 4, brownish to flesh-colored, more or less annulate, compressed; flowers and fruit unknown to us, but greenish yellow, according to Schumann.

Type locality: Real del Monte, Mexico.

Distribution: Real del Monte, Hidalgo, Mexico.

We have had this species in cultivation, but it never flowered and the plant has died. Schumann has given a good illustration of it. Rose, No. 8717, in part, from near Real del Monte, may belong here.

Schumann took up an unpublished name of Otto (Salm-Dyck, Cact. Hort. Dyck. 1844. 20. 1845) for this species.

Illustrations: Schumann, Gesamtb. Kakteen f. 63; Monatsschr. Kakteenk. 15: 160, as *Echinocactus tetraxiphus*.

FIG. 118.—Echinofossulocactus lloydii.

6. Echinofossulocactus albatus (Dietrich).

Echinocactus albatus Dietrich, Allg. Gartenz. 14: 170. 1846.

Simple, depressed-globose, 10 to 12 cm. in diameter, glaucous, the apex covered with spines; ribs about 35, flat, undulate; spines yellowish white; radial spines 10, setaceous, 1 cm. long; central spines 4, the uppermost flat and annulate (according to Schumann), the central terete, porrect; flowers white, 2 cm. long.

Type locality: Mexico.

Distribution: Mexico.

We do not know this species. The plant described by Schumann may be different from the original of Dietrich.

7. Echinofossulocactus lloydii sp. nov.

Nearly globular, 12 cm. in diameter or more, crowned by the long overtopping connivent spines; ribs very numerous, thin, more or less folded; areoles brown, woolly when young; radial spines acicular, 10 to 15, white, 2 to 8 mm. long, spreading; central spines 3, light brown, much elongated, somewhat incurved and connivent, the two lateral ones similar and not so papery, the middle one very thin, annulate, 4 to 9 cm. long; flowers small, nearly white; outer perianth-segments with a green stripe on the mid-vein; inner perianth-segments thin, narrowly oblong, acute; scales on the ovary ovate, acute, very thin.

Collected by F. E. Lloyd in Zacatecas, Mexico, August 14, 1908 (No. 7), and flowered in Washington the same year.

Figure 118 is from a photograph of the type plant.

8. Echinofossulocactus zacatecasensis sp. nov.

Plants solitary, globular, 8 to 10 cm. in diameter; ribs pale green; very thin, about 55; radial spines 10 to 12, spreading, acicular, white, 8 to 10 mm. long; central spines 3, brownish, 2 of them terete, but the middle one flattened, erect or connivent, longer than the other 2, sometimes 3 to 4 cm. long, never annulate; flowers 3 to 4 cm. broad, nearly white; inner perianth-segments linear-oblong, with an ovate apiculate tip, slightly tinged with lavender, 15 mm. long; style slender; stigma-lobes bifid(!); scales on the ovary broadly ovate, apiculate, scarious.

Collected by F. E. Lloyd in northern Zacatecas, Mexico, in 1908 (No. 58). Living specimens were sent to Washington and these flowered in March 1909.

FIG. 119.—Echinofossulocactus zacatecasensis.

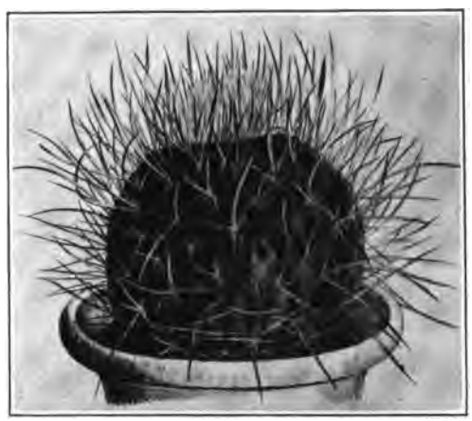


FIG. 120.—Echinofossulocactus arrigens.

This species is perhaps nearest *E. multicostatus*, but has fewer ribs and fewer radial spines.

Figure 119 is from a photograph of the type plant.

9. Echinofossulocactus lamellosus (Dietrich).

Echinocactus lamellosus Dietrich, Allg. Gartenz. **15**: 177. 1847.

Subglobose to short-cylindric, more or less depressed at the apex; ribs about 30, strongly flattened, more or less undulate; areoles remote, tomentose when young; spines 5 or 6, white (Schumann says yellow) with brown tips; flowers tubular, 3.5 to 4 cm. long; inner perianth-segments linear to linear-lanceolate, acute; stigma-lobes 5 to 8, linear, yellow.

Type locality: Mexico.

Distribution: Hidalgo, Mexico.

This species is known to us only from descriptions.

Echinocactus lamellosus fulvescens Salm-Dyck (Cact. Hort. Dyck. 1849. 30, 159. 1850) seems never to have been described.

10. Echinofossulocactus grandicornis (Lemaire).

Echinocactus grandicornis Lemaire, Cact. Gen. Nov. Sp. 30. 1839.
Echinocactus grandicornis fulvispinus Salm-Dyck in Labouret, Monogr. Cact. 210. 1853.
Echinocactus grandicornis nigrispinus Labouret, Monogr. Cact. 210. 1853.

Plants simple, globose to slender-cylindric, 10 cm. high, 5 to 6 cm. in diameter, glaucous-green, the apex hidden by the spines; ribs 34 or 35, much compressed, acute, undulate; areoles only a few to each rib, tomentose when young, naked in age; spines 8 to 11, at first yellowish; upper spine erect, stout, flat, 5 cm. long, the 2 lateral ones not so stout, a little shorter and nearly terete, the other spines slender; flowers whitish purple.

Type locality: Mexico.

Distribution: Mexico.

This species is known to us only from descriptions.

11. Echinofossulocactus arrigens (Link).

Echinocactus arrigens Link in Dietrich, Allg. Gartenz. **8**: 161. 1840.
Echinocactus sphaerocephalus Mühlenpfordt, Allg. Gartenz. **14**: 370. 1846.
Echinocactus allardtianus Dietrich, Allg. Gartenz. **15**: 178. 1847.
Echinocactus arrigens atropurpureus Salm-Dyck, Cact. Hort. Dyck. 1849. 31, 162. 1850.

Plants simple, deep-seated in the soil, globular, 5 to 7 cm. in diameter, glaucescent, more or less depressed at the apex; ribs 24, thin and wavy; spines 8 to 11, yellow (according to Schumann); uppermost spine elongated, 2 to 4 cm. long, flattened, brownish; central spines 2 or 3, more slender and not quite so long as the uppermost one; radial spines 6 to 8, acicular, usually pale, spreading; flowers small, 2 to 2.5 cm. long; inner perianth-segments oblong, apiculate, with a deep purple stripe running down the center and with pale, nearly white margins.

Type locality: Mexico.

Distribution: Mexico, but definite locality is unknown.

Echinocactus xiphacanthus Miquel (Linnaea **12**: 1. pl. 1, f. 1. 1838) is referred here by Schumann; if correctly, the name would replace *E. arrigens*. It is described as having 34 ribs; radial spines 4 or 5, short, pale; central spines 1 to 3, the upper one flat and long.

Echinocactus ensiferus Lemaire (Cact. Aliq. Nov. 26. 1838; *E. anfractuosus ensiferus* Salm-Dyck, Cact. Hort. Dyck. 1849. 31. 1850) is also referred here by Schumann. It, too, has priority over *E. arrigens*. It is described as globose; ribs 30 to 40.

Echinocactus arrectus Otto (Förster, Handb. Cact. 346. 1846), without description, is referred here as a synonym by Schumann.

Echinocactus ensiferus pallidus (Förster, Handb. Cact. 306. 1846) may also belong here.

Echinofossulocactus ensiformis (Lawrence in Loudon, Gard. Mag. **17**: 317. 1841) may or may not belong here.

Illustrations: Pfeiffer, Abbild. Beschr. Cact. **2**: pl. 27; Förster, Handb. Cact. ed. 2. f. 69; Schelle, Handb. Kakteenk. 173. f. 103, as *Echinocactus arrigens;* (?) Linnaea **12**: pl. 1, f. 1, as *E. xiphacanthus*.

Figure 120 is a reproduction of the first illustration cited above.

12. Echinofossulocactus violaciflorus (Quehl).

Echinocactus violaciflorus Quehl, Monatsschr. Kakteenk. **22**: 102. 1912.

Simple, at first globose, but becoming columnar, 8 to 10 cm. in diameter; ribs about 35, thin, deeply crenate; spines about 7, the 4 or 5 lower ones 7 to 12 mm. long, appressed or incurved, white, subulate, the 3 upper spines flattened, 3 to 6 cm. long, ascending and the uppermost ones connivent over the top of the plant; flowers 2 to 2.5 cm. long; perianth-segments narrow, acuminate, white with a violet or purplish stripe down the middle; scales on the ovary more or less imbricated, in 3 or 4 rows, broadly ovate, apiculate with scarious margins.

Type locality: Zacatecas, Mexico.

Distribution: Zacatecas and Aguas Calientes.

Our description is drawn in part from a plant sent to the New York Botanical Garden by Mr. H. Donnerstein in 1908, which flowered in April 1921, and in part from specimens collected by W. E. Safford at Aguas Calientes, Mexico, in 1907 (No. 1359).

Illustrations: Monatsschr. Kakteenk. **22**: 103, as *Echinocactus violaciflorus;* Ann. Rep. Smiths. Inst. **1908**: pl. 4, f. 5, as *Echinocactus crispatus.*

Plate XXIII, figure 5, shows the plant collected by William E. Safford, February 21, 1907 (No. 1359), which flowered in Washington and was painted May 9, 1907. Figure 121 is from a photograph of the same plant.

FIG. 121.—Echinofossulocactus violaciflorus.

13. Echinofossulocactus obvallatus (De Candolle) Lawrence in Loudon, Gard. Mag. **17**: 317. 1841.

Echinocactus obvallatus De Candolle, Prodr. **3**: 462. 1828.

Obovoid to globose, depressed at apex; ribs about 25, rather thin and undulate; spines about 8, 4 spines subulate, ascending or spreading, 4 spines short, perhaps not one-fourth the length of the longer ones; flowers central, very large; perianth-segments linear-oblong.

Type locality: Mexico.

Distribution: Hidalgo, Mexico.

This species is based on Mociño and Sessé's illustration of *Cactus obvallatus.* We have been unable to refer here, with any degree of approximation, any Mexican material we have seen. Pfeiffer's plate 22 (Abbild. Beschr. Cact. **2**:), originally referred here, must be quite distinct, for it has very differently shaped flowers, spines, and ribs. The Index Kewensis refers this illustration to *Echinocactus lancifer* of which it seems to be the type.

Echinocactus obvallatus spinosior of Lemaire (Salm-Dyck, Cact. Hort. Dyck. 1849. 30. 1850) and also of Monville (Salm-Dyck, Cact. Hort. Dyck. 1844. 20. 1845) as well as variety *pluricostatus* Monville (Salm-Dyck, Cact. Hort. Dyck. 1844. 20. 1845) are all names without description.

Echinocactus coptonogonus obvallatus Salm-Dyck (Cact. Hort. Dyck. 1844. 20. 1845), unpublished, doubtless belongs here.

Illustrations: Cact. Journ. **2**: 102; Dict. Gard. Nicholson **1**: 500. f. 692; Förster, Handb. Cact. ed. 2. 535. f. 68; Schelle, Handb. Kakteenk. 172. f. 101; Watson, Cact. Cult. 113. f. 41; Karsten and Schenck, Vegetationsbilder **2**: pl. 19, *a;* Mém. Mus. Hist. Nat. Paris **17**: pl. 9, as *Echinocactus obvallatus.*

Figure 122 is copied from the last illustration cited above.

14. Echinofossulocactus pentacanthus (Lemaire).

Echinocactus pentacanthus Lemaire, Cact. Aliq. Nov. 27. 1838.
Echinocactus biceras Jacobi, Allg. Gartenz. **16**: 370. 1848.
Echinocactus anfractuosus pentacanthus Salm-Dyck, Cact. Hort. Dyck. 1849. 31. 1850.

Simple, depressed-globose to short-cylindric, more or less glaucous; ribs about 25, perhaps even 40 to 50; areoles only a few to the rib; spines 5, unequal, grayish red, hardly angled, flattened; 3 upper spines erect or spreading; 2 lower spines much slenderer and shorter than the upper; flowers large for this group, deep violet; perianth-segments with white margins.

Type locality: Mexico.

Distribution: Mexico, in the states of Hidalgo and San Luis Potosí, according to Schumann.

We know this species definitely only from Lemaire's plate which is doubtless typical. According to Schumann, it has the same range as *E. obvallatus*, a species which, judging from the illustrations, must be very near it, if not actually the same.

A specimen collected by Rose in San Juan del Rio in 1905 has 5 spines in a cluster, but the whole plant is more heavily armed than Lemaire's illustration would indicate.

Echinocactus anfractuosus laevior Monville (Labouret, Monogr. Cact. 220. 1853) was given as a synonym of *E. anfractuosus pentacanthus*.

Illustration: Lemaire, Icon. Cact. pl. 11, as *Echinocactus pentacanthus*.

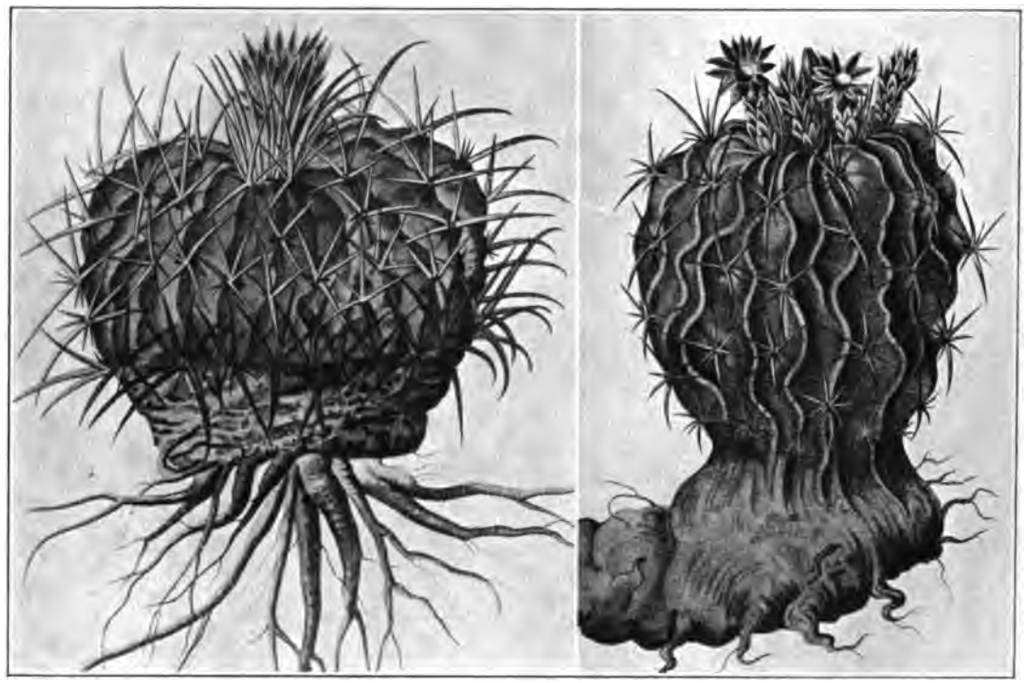


FIG. 122.—Echinofossulocactus obvallatus. FIG. 123.—Echinofossulocactus crispatus.

15. **Echinofossulocactus crispatus** (De Candolle) Lawrence in Loudon, Gard. Mag. 17: 317. 1841.
Echinocactus crispatus De Candolle, Prodr. 3: 461. 1828.

Plant obovoid, somewhat depressed at apex; ribs about 25, more or less folded, somewhat undulate; spines 10 or 11, rigid, unequal; flowers central, rather small; perianth-segments in 2 series, purplish, oblong-linear, acute; flower-tube covered with imbricating scales.

Type locality: Mexico.

Distribution: Hidalgo, Mexico, according to Schumann.

This species was based on Mociño and Sessé's illustration which De Candolle reproduced and *Cactus crispatus* Mociño and Sessé (De Candolle, Prodr. 3: 462. 1828) was the first name given to it, but it was never formally published. De Candolle, himself, does not compare it with *E. obvallatus* which is of this series, but with *E. cornigerus*, belonging to a very different series. After De Candolle had described the species he states (Mém. Mus. Hist. Nat. Paris 17: 115. 1828) that the ribs vary from 30 to 60; this was doubtless drawn from new material, perhaps sent by Thomas Coulter who was then collecting in eastern Mexico. At the same place he describes var. *horridus*, based on Coulter's plant, and says that the spines are stouter, erect, long, and grayish brown.

Echinocactus stenogonus, first mentioned by Schumann (Monatsschr. Kakteenk. **5**: 107. 1895), who credits the name to Weber, seems to have been only a garden name for *Echinocactus crispatus*.

Watson (Cact. Cult. 99) states that "it is apparently closely allied to *E. longihamatus*," but this is hardly warranted.

The specimen figured in the Dictionary of Gardening, referred to below, may belong elsewhere. It is described as having about 20 ribs; radial spines 8 or 9, spreading, setaceous, white with brown tips; central spines 4, reddish and much larger than the radials. The plant came from the collections of F. A. Haage jr., of Erfurt. It may belong to *E. heteracanthus*. *E. crispatus cristatus* Gürke (Monatsschr. Kakteenk. **16**: 188. 1906) is also different.

E. flexispinus Salm-Dyck (Cact. Hort. Dyck. 1849. 159. 1850. Not Engelmann, 1848) is referred here by Schumann. It is described, however, as follows:

Globose or obovate, light green; ribs numerous, 30 or 31, strongly compressed, undulate, interrupted; areoles remote, when young bearing yellow wool; 3 upper spines recurved, ascending, somewhat flattened, a central one porrect and subulate, the 4 lower spines elongated, subulate, but flexible, white when young, pale brown when old; flowers unknown.

E. undulatus Dietrich (Allg. Gartenz. **12**: 187. 1844) is referred here also by Schumann, but Salm-Dyck thought it was unlike his *E. flexispinus* for the 3 upper spines are large and flat and the 4 lower ones are rigid.

Illustrations: Mém. Mus. Hist. Nat. Paris **17**: pl. 8; (?)Dict. Gard. Nicholson **1**: f. 688; Schelle, Handb. Kakteenk. 172. f. 102; Watson, Cact. Cult. 99. f. 33, as *Echinocactus crispatus;* Monatsschr. Kakteenk. **16**: 189, as *Echinocactus crispatus cristatus*.

Figure 123 is copied from the first illustration above cited.

16. Echinofossulocactus dichroacanthus (Martius).

Echinocactus dichroacanthus Martius in Pfeiffer, Enum. Cact. 62. 1837.
Echinocactus dichroacanthus spinosior Monville in Labouret, Monogr. Cact. 213. 1853.

Plant obovoid, dull green, 15 cm. high, 10 cm. in diameter, somewhat umbilicate at apex; ribs 32, thin, acute, undulate, somewhat wavy; areoles only a few on each rib, white-tomentose; upper spines 3, erect, flattened, purplish; radial spines 4 to 6, white; flowers and fruit unknown.

Type locality: Mexico.

Distribution: Hidalgo, Mexico.

Schumann's description differs somewhat from the original, but the only plant he refers to is that of Karwinsky, which is probably the type.

17. Echinofossulocactus anfractuosus (Martius) Lawrence in Loudon, Gard. Mag. **17**: 317. 1841.

Echinocactus anfractuosus Martius in Pfeiffer, Enum. Cact. 63. 1837.
Echinocactus anfractuosus spinosior Lemaire, Cact. Gen. Nov. Sp. 89. 1839.
Echinocactus anfractuosus orthogonus Monville in Labouret, Monogr. Cact. 220. 1853.

Plant simple, somewhat longer than broad, 12.5 cm. long, 6 cm. in diameter, dull green; ribs many (about 30, according to Schumann), compressed, wavy, each bearing only a few areoles; spines somewhat curved, straw-colored with brown tips; radial spines 7, stout, the 3 upper radials much larger, about 3 cm. long, the 4 lower radials slender; central spine solitary, 2.5 cm. long, brownish; perianth-segments purple with white margins.

Type locality: Mexico.

Distribution: Mexico, in Hidalgo at Pachuca and Ixmiquilpan.

18. Echinofossulocactus tricuspidatus (Scheidweiler).

Echinocactus tricuspidatus Scheidweiler, Allg. Gartenz. **9**: 51. 1841.
Echinocactus melmsianus Wegener, Allg. Gartenz. **12**: 65. 1844.
Echinocactus phyllacanthus tricuspidatus Förster, Handb. Cact. 311. 1846.

Globose to short-cylindric, 5 to 8 cm. broad; ribs numerous, 30 to 55, thin, wavy; areoles at first lanate, afterwards naked; spines 5 (Schumann says 9 to 11), the upper one thin, compressed,

sometimes 3-toothed at apex, 8 to 33 mm. long, reddish with a black tip; the other 4 spines spreading, more or less appressed, straight or recurved, gray or reddish with black tips, much shorter than the upper one; flowers greenish yellow, 1.5 cm. long; inner perianth-segments short-oblong, obtuse, the outer ones more or less acute or apiculate; scales on the ovary broadly ovate with a scarious margin and a more or less prominent cusp.

Type locality: Not cited.

Distribution: San Luis Potosí, Mexico.

Our description is based on a large series of specimens all from near San Luis Potosí where they were collected by Dr. Edward Palmer in 1902 and 1905 and by C. R. Orcutt about 1915. This species is unlike any of its relatives, being characterized by the very short foliaceous upper spine.

Schumann's description of this species does not read much like the original and must represent a different species.

19. Echinofossulocactus phyllacanthus (Martius) Lawrence in Loudon, Gard. Mag. 17: 317. 1841.

Echinocactus phyllacanthus Martius, Allg. Gartenz. 4: 201. 1836.
Echinocactus phyllacanthoides Lemaire, Cact. Gen. Nov. Sp. 28. 1839.
Echinofossulocactus phyllacanthus macracanthus Lawrence in Loudon, Gard. Mag. 17: 317. 1841.
Echinofossulocactus phyllacanthus micracanthus Lawrence in Loudon, Gard. Mag. 17: 317. 1841.

Simple, depressed-globose to short-cylindric, 3 to 15 cm. high, 4 to 10 cm. in diameter, dull green; ribs 30 to 35, thin, undulate; areoles only a few to a rib, white-tomentose when young; spines 5 to 9; upper spine, or rarely 2 spines, much elongated, erect or connivent over the top of the plant, flattened, thin, somewhat annulate, 4 cm. long; other spines weak-subulate, usually pale and spreading; flowers 15 to 20 mm. long, yellowish; inner perianth-segments acute.

Type locality: Mexico.

Distribution: Central Mexico; also reported from Mazatlan on the Pacific Coast of Mexico.

A good illustration of this species is published by Pfeiffer and Otto which is doubtless typical. Karwinsky's plant, from which the illustration was made, came from near Pachuca, Mexico. At this locality Dr. Rose collected flowers in 1905 (No. 8717) and these correspond to Pfeiffer's illustrations. At the same time and under the same number was collected a second species of this genus which is very distinct, showing how easily the species of this group can be confused.

Several varieties have been described, but these may not all belong here. These are as follows: *laevior* Monville, *laevis* Lemaire, *macracanthus*, *micracanthus*, *pentacanthus*, *tenuiflorus* (*E. tenuiflorus* Link in Salm-Dyck, Cact. Hort. Dyck. 1844. 20. 1845, name only) and *tricuspidatus* Förster.

Echinocactus stenogoni occurs occasionally as a legend for illustrations. This of course refers to *Echinocactus* series *stenogoni*. The first one which we have examined (Krook, Handb. Cact. 71. f. a) is figure 2 taken from Pfeiffer and Otto's plate 9, cited below. It occurs also in de Laet (Cat. Gen. f. 50, No. 6) for this or some closely related species. A third reference also occurs (Wiener Ill. Gart. Zeit. 29: f. 22, No. 6).

Illustrations: Pfeiffer and Otto, Abbild. Beschr. Cact. 1: pl. 9; Abh. Bayer. Akad. Wiss. München 2: (see 738) pl. 2, f. 3, as *Echinocactus phyllacanthus*.

Figure 124 shows the first illustration cited above.

20. Echinofossulocactus lancifer (Dietrich).

Echinocactus lancifer Dietrich, Allg. Gartenz. 7: 154. 1839.
Echinocactus dietrichii Heynhold, Nom. 2: 92. 1846.

Nearly ovoid, somewhat depressed at apex; ribs numerous, strongly compressed, undulate; areoles few to each rib, when young tomentose; spines 8, white or brownish at apex; some of them broad and flat; flowers rather large, rose-colored; flower-tube described as long; perianth-segments linear-oblong, widely spreading.

Type locality: Mexico.

Distribution: Mexico.

Pfeiffer in 1837 attempted to identify *Echinocactus obvallatus* with certain plants then in the Schelhase collection, but later when he figured his plant he questioned this identification, although he did not rename it. Dietrich, however, in 1839, named the *Echinocactus obvallatus* Pfeiffer in part, as above.

Echinocactus lancifer was used by Reichenbach (in Terscheck, Suppl. Cact. 2), but whether properly described or not we do not know. The name was, however, formally published by Walpers in 1843 (Repert. Bot. 2: 320), but this date was after Dietrich had published his name. Heynhold evidently considered Reichenbach's name properly published for he changed Dietrich's name to *Echinocactus dietrichii.*

Illustration: Pfeiffer, Abbild. Beschr. Cact. 2: pl. 22 (*fide* Index Kewensis), as *Echinocactus obvallatus.*

Figure 125 shows the illustration cited above.

FIG. 124.—Echinofossulocactus phyllacanthus. FIG. 125.—Echinofossulocactus lancifer.

21. Echinofossulocactus gladiatus (Link and Otto) Lawrence in Loudon, Gard. Mag. 17: 317. 1841.

Echinocactus gladiatus Link and Otto, Verh. Ver. Beförd. Gartenb. 3: 426. 1827.
Melocactus gladiatus Link and Otto, Verh. Ver. Beförd. Gartenb. 3: pl. 17. 1827.
Echinocactus gladiatus ruficeps Lemaire in Labouret, Monogr. Cact. 215. 1853.
Echinocactus gladiatus intermedius Lemaire in Labouret, Monogr. Cact. 215. 1853.

Plant glaucescent, ovoid to oblong, 12.5 cm. high, 10 cm. in diameter with a depressed apex covered with connivent spines; ribs prominent, rather broad, obtuse, 14 to 22; spines 10, gray, 4 upper spines subulate, of these 3 usually ascending, the central spreading or porrect, the largest 5 cm. long, 4 lower spines acicular; flowers and fruit unknown.

Type locality: Mexico.

Distribution: Probably eastern Mexico.

Schumann in his monograph does not take for this name the plant as originally described and figured by Link and Otto, but a later description used by Pfeiffer and adopted by Salm-Dyck. The original *Echinocactus gladiatus,* based on Deppe's plant, is very different from Schumann's plant.

The plant is known to us only from description and illustration. We are following Lawrence in including this little-known species in *Echinofossulocactus*, but we are very doubtful about its true relationship.

Illustration: Verh. Ver. Beförd. Gartenb. 3: pl. 17, as *Melocactus gladiatus*.

Figure 126 is a reproduction of the illustration cited above.

22. Echinofossulocactus confusus sp. nov.

Simple, pale green, stout, columnar to short-clavate, 6 to 15 cm. high, 6 to 8 cm. in diameter; ribs 26 to 30, thin, low, wavy; areoles 4 or 5 on each rib, 2 to 3 cm. apart; spines all yellow, subulate; radial spines 4 or 5, only slightly flattened, 7 to 10 mm. long; central spine solitary, up to 4 cm. long, usually porrect; flowers purplish, 4 cm. broad; perianth-segments oblong, acute.

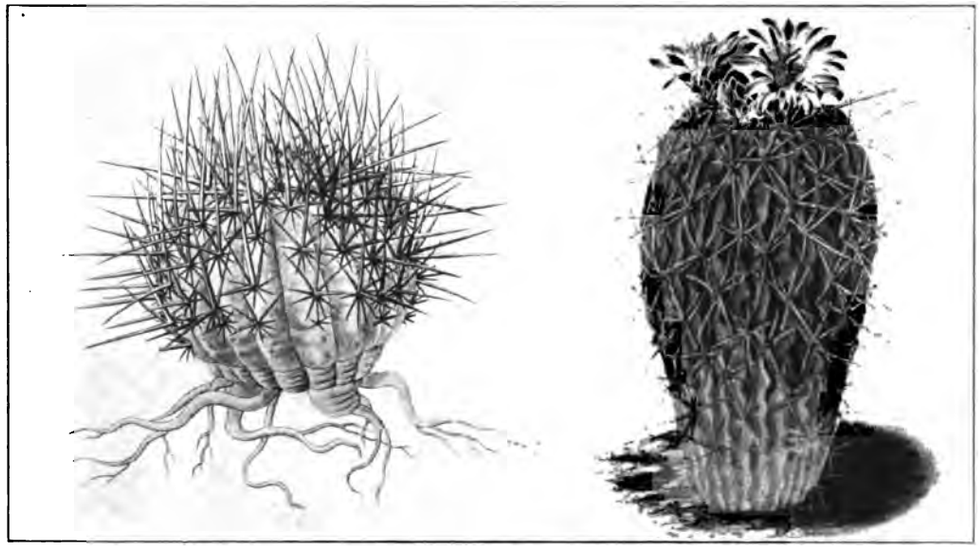


FIG. 126.—Echinofossulocactus gladiatus. FIG. 127.—Echinofossulocactus confusus.

Our description is based on plate 159 of Blühende Kakteen, there called *Echinocactus gladiatus* Salm-Dyck.

This is also *Echinocactus gladiatus* Schumann (Gesamtb. Kakteen 374) in most part. Schumann states, however, that the flowers are yellow. Salm-Dyck never described *E. gladiatus* as a new species although he seems to have described a different plant than Link and Otto under their name. This plant is therefore without any true synonyms. Living plants, doubtless from Mexico, were in the Botanical Garden at Berlin.

Figure 127 is a reproduction of the illustration mentioned above.

PUBLISHED SPECIES, PERHAPS OF THIS GENUS.

The following species, judging from the brief unsatisfactory descriptions, belong here. They are all Mexican. None has been illustrated and the flowers of only a few of them are known.

ECHINOCACTUS ACANTHION Salm-Dyck, Cact. Hort. Dyck. 1849. 161. 1850.

Stems globose, 10 cm. in diameter or more, light green; ribs 35 to 40; upper spines 3, flattened, the central one stouter, the longest 35 mm. long; lower radial spines 8, slender, spreading, white; central spines 2, subulate; flowers unknown.

ECHINOCACTUS ACROACANTHUS Stieber, Bot. Zeit. 5: 491. 1847.

Almost globose; ribs 27; areoles when young white-woolly, in age naked; spines 7, the 3 upper ones flattened, 2.5 to 3 cm. long, yellowish brown, with black tips; the 4 lower spines smaller than the upper, 8 to 10 mm. long, whitish; flowers and fruit unknown.

Distribution: Mexico.

The original spelling of this name was *E. acrocanthus*, doubtless a typographical error.

ECHINOCACTUS ADVERSISPINUS Mühlenpfordt, Allg. Gartenz. **16**: 10. 1848.

Obovoid; ribs 34, acute; areoles 3 cm. apart, white, lanate when young, naked when old; radial spines 7; central spine solitary, the 3 upper radials and central spine elongated and very different from the lower radials, 3 cm. long.

ECHINOCACTUS BRACHYCENTRUS Salm-Dyck, Cact. Hort. Dyck. 1849. 160. 1850.

Echinocactus brachycentrus olygacanthus Salm-Dyck, Cact. Hort. Dyck. 1849. 160. 1850.
Echinocactus oligacanthus Salm-Dyck in Schumann, Gesamtb. Kakteen 374. 1898. Not Pfeiffer, 1837.

Plant simple, short-cylindric, 20 cm. high, 15 cm. in diameter, very stout, yellowish green; ribs 30 to 35, strongly compressed, more or less undulate; spines all radial or sometimes one short central, the 3 upper spines erect, brownish (yellow, according to Schumann), the 2 lower ones white, smaller, and slenderer than the others.

Dr. Rose collected in San Juan del Rio in August 1905 a plant which answers very well this description, at least as far as it goes. It has 3 erect, stout, brown spines, the middle one much flattened. The two lower spines are small and reflexed, but brown. Other specimens collected by Dr. Rose in this region are somewhat similar, but the lower spines are in four's instead of two's.

Echinocactus brachiatus (Labouret, Monogr. Cact. 636. 1853) was written by mistake for this species.

ECHINOCACTUS CEREIFORMIS De Candolle, Mém. Mus. Hist. Nat. Paris **17**: 115. 1828.

Somewhat cylindric, 10 cm. high, green; ribs 13, flattened, separated by acute intervals, somewhat obtuse; areoles somewhat velvety, 3 to each rib; spines grayish, slender, but rigid; radial spines 7; central spine solitary, straight.

This species was based on a defective plant brought by Coulter from Mexico and the type has not been preserved. De Candolle put a question mark after the genus and also asked whether it might not be a young plant of some *Cereus*, but we do not know any species of *Cereus* with so few areoles on the ribs; in this respect it is like *Echinofossulocactus*, perhaps *E. coptonogonus*. The plant was unknown to Labouret and to Schumann and is listed by both among the unknown species.

ECHINOCACTUS DEBILISPINUS Berg, Allg. Gartenz. **8**: 131. 1840.

Subglobose to clavate, 16 cm. high, somewhat umbilicate at apex; ribs 34, flattened, wavy, acute; areoles few to each rib, white-tomentose when young, naked in age; spines 7 to 9, the 3 upper spines flat, yellowish white, brown at tip, the uppermost one longer, thinner, annulate, 4 to 6 lower spines subterete, subulate, yellowish white.

ECHINOCACTUS ELLEMEETII Miquel, Nederl. Kruidk. Arch. **4**: 337. 1858.

This species is supposed to be of this relationship, although it has only 13 ribs.

ECHINOCACTUS FLEXUOSUS Dietrich, Allg. Gartenz. **19**: 347. 1851.

Subglobose, umbilicate at apex; ribs strongly compressed, undulate, wavy; areoles few on each rib, when young tomentose; spines white, spotted; upper spine ensiform; central spines 3-angled, a little curved.

ECHINOCACTUS FLUCTUOSUS Dietrich, Allg. Gartenz. **19**: 154. 1851.

Subglobose, 5 cm. high; ribs numerous, strongly compressed, undulate; areoles few to each rib, tomentose; spines 7, grayish, subulate, unequal, some of them flattened; central spine solitary, erect, terete.

ECHINOCACTUS FOERSTERI Stieber, Bot. Zeit. **5**: 491. 1847.

Nearly globular, dark green; ribs 21, sharp on the edge; spines up to 9, the 3 upper longer and stronger than the others, 12 to 18 mm. long, dark red, the middle one very thin; the lower spines 4 to 6, very small, bristly, 2 to 8 mm. long.

Known only from the type locality.

ECHINOCACTUS GRISEISPINUS Jacobi, Allg. Gartenz. **24**: 99. 1856.

Stems clavate, 15 cm. high, 10 cm. in diameter, glaucescent, somewhat umbilicate at apex; ribs 34 to 38; radial spines 7; 3 upper spines erect, when young purple with black tips, about 2.5 cm long; lower spines white; central spine solitary, 2.5 cm. long or more.

ECHINOCACTUS HEXACANTHUS Mühlenpfordt, Allg. Gartenz. **14**: 369. 1846.

Obovate, umbilicate at apex; ribs 34, flattened; radial spines 5; central spine solitary.

ECHINOCACTUS HEYDERI Dietrich, Allg. Gartenz. **14**: 170. 1846.

Obovate, pale green, rounded at apex; ribs numerous, strongly compressed; spines 8, grayish white; central spine solitary, terete, porrect.

ECHINOCACTUS HOOKERI Mühlenpfordt, Allg. Gartenz. **13**: 345. 1845.

Obovate; ribs numerous; upper spines flattened, incurved, 5 cm. long; radial spines whitish, 16 mm. long.

ECHINOCACTUS HYSTRICHOCENTRUS Berg, Allg. Gartenz. **8**: 131. 1840.

Echinocactus hystrichodes Monville in Labouret, Monogr. Cact. 215. 1853.

Clavate, 10 cm. high, somewhat umbilicate at apex; ribs 39, compressed, wavy; areoles only a few to each rib; spines 8, all flat and thin; the 3 upper larger, whitish gray with black tips; central spine solitary, erect, incurved, annulate.

ECHINOCACTUS LINKEANUS Dietrich, Allg. Gartenz. **16**: 298. 1848.

Spines 6, white; radial spines 5; central spine solitary, flat, variously curved.

ECHINOCACTUS MACROCEPHALUS Mühlenpfordt, Allg. Gartenz. **14**: 370. 1846.

Subglobose, light green, depressed at apex; ribs 34, somewhat acute, undulate; areoles 5 cm. apart; radial spines 7 or 8; the 3 upper ones elongated; the 4 lower ones short; central spine solitary, erect.

ECHINOCACTUS MAMMILLIFER Miquel, Linnaea **12**: 8. 1838.

This seems to be a seedling and may belong to some species of this genus. Its strongly compressed ribs certainly suggest this genus. Miquel does not state where his plant came from, but suggests a relationship with Pfeiffer's second group to which *Echinocactus scopa* and other South American species belong; it does not seem to us to belong with it. Schumann did not know the species. *Echinocactus theiacanthus* Lemaire (Cact. Gen. Nov. Sp. 86. 1839) which was originally spelled *E. theionacanthus* Lemaire (Cact. Aliq. Nov. 22. 1838) was taken up by Lemaire as *E. mammillifer*. This is further discussed on page 137.

ECHINOCACTUS OCHROLEUCUS Jacobi, Allg. Gartenz. **24**: 101. 1856.

Stems cylindric to clavate, 10 cm. high, 7.5 cm. in diameter, light green, somewhat umbilicate at apex; ribs 33 to 36, acute; areoles only a few to each rib; spines 7, yellowish; 3 upper spines 3 cm. long, erect; 4 lower spines very short.

ECHINOCACTUS OCTACANTHUS Mühlenpfordt, Allg. Gartenz. **16**: 10. 1848.

Obovate; ribs 40 to 44, compressed; areoles with white hairs when young; radial spines 7; central spine solitary.

ECHINOCACTUS QUADRINATUS Wegener, Allg. Gartenz. **12**: 66. 1844.

Echinocactus wegeneri Salm-Dyck, Cact. Hort. Dyck. 1849. 31. 1850.

Plant subcylindric, 7.5 cm. high, 5 cm. in diameter; ribs 34 to 36, strongly compressed; areoles remote, somewhat velvety when young; spines usually 7; 3 upper spines subulate, angled, the middle one shorter; central spine solitary, grayish brown, sometimes wanting; lower spines 4, recurved, reddish white, the 2 lowermost ones a little longer.

ECHINOCACTUS RAPHIDACANTHUS Salm-Dyck, Cact. Hort. Dyck. 1849. 160. 1850.

Stems globose, light green; ribs 35 to 40, strongly compressed; young areoles white, velvety. upper and central spines 4, stout, yellowish red, the uppermost one broad and flat; lower spines 6; slender, white.

ECHINOCACTUS RAPHIDOCENTRUS Jacobi, Allg. Gartenz. **24**: 101. 1856.

Plant depressed-globose, 5 cm. high, 6 cm. in diameter, light green, somewhat umbilicate; ribs 24 to 28, acute; radial spines 7, the 3 upper ones reddish brown.

1. *Ferocactus pringlei.*

2. *Ferocactus diguetii.*

ECHINOCACTUS SULPHUREUS Dietrich, Allg. Gartenz. 13: 170. 1845.

Globose, 7 to 10 cm. in diameter, green, depressed at the apex, very spiny; ribs numerous, much compressed, undulate, each bearing a few areoles; spines 8 or 9, white, when young with brown tips, compressed at base, subulate; central spine solitary, porrect, long; flowers probably yellow.

The plant described by Schumann as *E. gladiatus* has yellow spines, a character not referred to either under that species, as originally described, or under *E. sulphureus*. According to Salm-Dyck, this plant is near *Echinocactus anfractuosus*.

ECHINOCACTUS TELLII Hortus, Monatsschr. Kakteenk. 11: 161. 1901.

Said to be of this relationship.

ECHINOCACTUS TERETISPINUS Lemaire, Hort. Univ. 6: 60. 1845.

"We have observed, in the rich collection of M. Odier, a distinguished amateur of Bellevue, a species belonging to our section *Stenogoni* of *Echinocactus*, with cylindrical spines, a character peculiar to this section, which is possessed by only one other species, the *E.* [name not given], but in the latter the upper spine is flat, and anyway these two plants are quite distinct. Our specific name signifies this character. We intend to refer again to this curious species and at the same time to point out many other novelties of M. Odier, which he received directly from Mexico."

ECHINOCACTUS TRIBOLACANTHUS Monville in Labouret, Monogr. Cact. 221. 1853.

Cylindric; ribs numerous, flat; spines 8; flowers red.

ECHINOCACTUS TRIFURCATUS Jacobi, Allg. Gartenz. 24: 100. 1856.

Plant pyriform, 6 cm. in diameter near the apex, umbilicate at apex, glaucous-green; ribs 32, membranaceous, compressed; spines 5.

16. FEROCACTUS gen. nov.

Globular to cylindric, often large cacti; ribs thick and prominent; spines well developed, either straight or hooked; areoles usually large, bearing flowers only when young and then only just above the spine-clusters, more or less felted when young; flowers usually large, broadly funnel-shaped to campanulate, usually with a very short tube; stamens numerous, borne on the throat, short; ovary and flower-tube very scaly; scales naked in their axils; fruit oblong, usually thick-walled and dry, dehiscing by a large basal pore; seeds black, pitted, never tuberculate; embryo curved.

Type species: *Echinocactus wislizeni* Engelmann.

The oldest species in this genus is *Ferocactus nobilis* which was collected by William Houston in Mexico before 1733. It was described by Miller in the Gardeners' Magazine 7th ed. 1759. Upon this description Linnaeus in 1767 (Mantissa 243) based his *Cactus nobilis* and Miller in 1768 (Gard. Mag.) his *Cactus recurvus*.

The generic name is from *ferus* wild, fierce, and *cactus*, referring to the very spiny character of the plants.

We recognize 30 species, heretofore treated under *Echinocactus*, all from North America. The genus differs from *Echinocactus* proper in its fruits and flowers.

KEY TO SPECIES.

A. Giant species, often 1 meter high or more (except apparently 3, 4, and 5).
  B. Areoles with a marginal row of bristles or hairs.
    Areoles with marginal weak hairs.
      Central spines yellowish; flowers yellow ..... 1. *F. stainesii*
      Central spines bright red; flowers red ..... 2. *F. pringlei*
    Areoles with marginal bristles.
      Central spine hooked.
        Central spines 8 cm. long or less, 4 to 6 mm. wide.
          Inner perianth-segments pink.
            Inner perianth-segments linear ..... 3. *F. fordii*
            Inner perianth-segments oblong ..... 4. *F. townsendianus*
          Inner perianth-segments yellow to red, the outer pinkish.
            Inner perianth-segments about 2 cm. long; spines yellow to red ..... 5. *F. chrysacanthus*
            Inner perianth-segments 4 to 5 cm. long; spines white to reddish ..... 6. *F. wislizeni*
        Central spines up to 12 cm. long and 8 mm. wide ..... 7. *F. horridus*

KEY TO SPECIES—continued.

Central spine straight or more or less curved, but not hooked.
Central spines flexible, thin.
Central spines more or less appressed; seeds very small, not angled, less than 2 mm. long ..... 8. *F. lecontei*
Central spines more or less tortuous and spreading; seeds larger than those of *F. lecontei*, more than 3 mm. long ..... 9. *F. acanthodes*
Central spine dagger-like, straight, erect ..... 10. *F. santa-maria*
BB. Areoles without marginal hairs or bristles.
Spines all alike ..... 11. *F. diguetii*
Radial spines different from the central.
Central spines more or less hooked.
Central spine 1 ..... 12. *F. covillei*
Central spines 4 ..... 13. *F. peninsulae*
Central spines not hooked.
Flowers lemon-yellow; inner perianth-segments elongated ..... 14. *F. rectispinus*
Flowers crimson; perianth-segments all short ..... 15. *F. orcuttii*
AA. Plants much smaller than the last, 6 dm. in diameter or less, sometimes, however, forming large clumps.
Areoles with stout spines and weak bristles ..... 16. *F. robustus*
Areoles with stout spines only.
Spines never hooked.
Spines all straight.
Scales on ovary broader than linear and not with long ciliate margins.
Flowers 4 to 5 cm. long, large; plant green.
Plant flattened; ribs acute; margin of scales of ovary not ciliate .... 17. *F. echidne*
Plant rounded; ribs obtuse; margin of scales of ovary ciliate ..... 18. *F. alamosanus*
Flowers 2 cm. long, small; plant glaucous ..... 19. *F. glaucescens*
Scales on ovary linear, with long ciliate margins ..... 20. *F. flavovirens*
Spines more or less curved.
Flowers small, 3.5 cm. long or less; ribs up to 24 ..... 21. *F. melocactiformis*
Flowers larger; ribs fewer than in the last.
Scales on ovary acute ..... 22. *F. macrodiscus*
Scales on ovary obtuse.
Central spines strongly flattened ..... 23. *F. viridescens*
Central spines nearly terete ..... 24. *F. johnsonii*
Some of the spines hooked or recurved at the top.
Central spines or one of them broad and short.
Central spine solitary ..... 25. *F. nobilis*
Central spines several.
Radial spines all straight ..... 26. *F. latispinus*
Radial spines on lower side of areoles hooked ..... 27. *F. crassihamatus*
Central spines slender and elongated.
Flowers large, yellow ..... 28. *F. hamatacanthus*
Flowers small, pinkish to brownish ..... 29. *F. uncinatus*
AAA. Species not grouped ..... 30. *F. rostii*

1. **Ferocactus stainesii** (Hooker).

Echinocactus stainesii Hooker in Audot, Rev. Hort. 6: 248. 1845.
Echinocactus pilosus Galeotti in Salm-Dyck, Cact. Hort. Dyck. 1849. 148. 1850.
*Echinocactus pilosus steinesii** Salm-Dyck, Cact. Hort. Dyck. 1849. 149. 1850.

Simple or proliferous, globular to columnar, up to 1.5 meters high; ribs 13 to 20, compressed, more or less undulate; areoles distant, circular; radial spines reduced to long white hairs; central spines several, subulate, at first purplish, becoming pale yellow in age; flowers yellow; fruit unknown.

Type locality: Not cited.
Distribution: San Luis Potosí, Mexico.

This species differs from the following one in having more distant ribs, the areoles more widely separated, the spines duller colored, more numerous, somewhat curved, two of them decidedly flattened and the hairs white. We know the plant only from description and illustrations.

FIG. 128.—Section of rib of Ferocactus stainesii.

*This plant was named for Fred. Staines whose name is sometimes wrongly spelled Staine and Steins and hence the specific name *steinsii* used by Salm-Dyck is incorrect.

M. E. Eaton del.

1. Top of flowering plant of *Ferocactus townsendianus*.
2. Top of flowering plant of *Ferocactus wislizeni*.
3. Flower of *Ferocactus diguetii*.

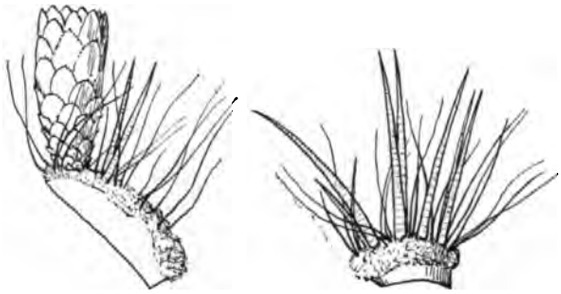
(All natural size.)

A Heen & Co

Echinocactus piliferus Lemaire (Labouret, Monogr. Cact. 186. 1853) is usually referred here, but was not described in the place cited.

Illustrations: Schumann, Gesamtb. Kakteen f. 52; Monatsschr. Kakteenk. **22**: 39, Möllers Deutsche Gärt. Zeit. **25**: 484. f. 16; Schelle, Handb. Kakteenk. 147. f. 72; Gartenwelt **7**: 277, as *Echinocactus pilosus;* Rev. Hort. II. **4**: 1; Belg. Hort. **4**: pl. 2, as *Echinocactus stainesii.*

Figure 128 is copied from the first illustration above cited.



FIGS. 129 and 130.—Flower and cluster of spines of Ferocactus pringlei. ×0.5.

FIG. 131.—Ferocactus pringlei.

FIG. 131 *a*.—Ferocactus wislizeni. Natural size.

2. Ferocactus pringlei (Coulter).

Echinocactus pilosus pringlei Coulter, Contr. U. S. Nat. Herb. **3**: 365. 1896.
Echinocactus pringlei Rose, Contr. U. S. Nat. Herb. **10**: 127. 1906.

Growing in clumps, becoming cylindric, sometimes 3 meters high and 3 to 4 dm. in diameter; ribs usually 16 to 18, more or less compressed; areoles numerous, closely set or contiguous, the outer margin with a row of white or straw-colored hairs, 2 to 4 cm. long; spines red, various, the three lower ones slender, almost acicular, the innermost much stouter, somewhat flattened, angular, curved or nearly straight; flowers red without, yellow within, 2.5 cm. long; scales on the ovary numerous, orbicular, imbricated; inner perianth-segments oblanceolate, obtuse or apiculate; fruit yellow, somewhat succulent, dehiscing by a basal pore, 3 to 4 cm. long, crowned by the persisting perianth; seeds 1.5 mm. long, brownish, pitted, with a small basal hilum.

Type locality: Jimulco, Coahuila, Mexico.

Distribution: Mountains of Coahuila and Zacatecas, Mexico.

Illustrations: Monatsschr. Kakteenk. **22**: 87, as *Echinocactus pilosus;* Ann. Rep. Smiths. Inst. **1908**: pl. 13, f. 5, as *Echinocactus pringlei.*

Plate XI, figure 1, is from a photograph of the plant, taken by F. E. Lloyd in Zacatecas, Mexico, in 1907. Figure 129 shows the flower of a plant collected by F. E. Lloyd at Zacatecas in 1908; figure 130 shows its spines and hairs; figure 131 is from a photograph taken by Robert Runyon near Saltillo, Mexico, in 1921.

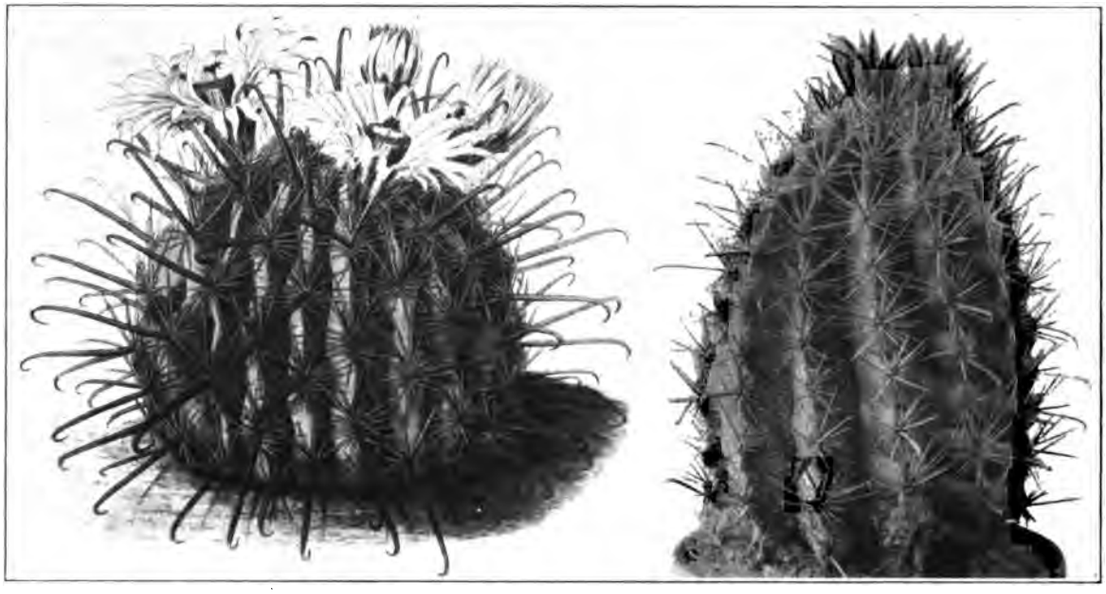


FIG. 132.—Ferocactus fordii.

FIG. 133 —Ferocactus townsendianus.

3. Ferocactus fordii (Orcutt).

Echinocactus fordii Orcutt, Rev. Cact. 1: 56. 1899.

Globose to short-cylindric, grayish green, 12 cm. in diameter; ribs usually 21, about 1 cm. high; areoles about 2 cm. apart; radial spines whitish, acicular, widely spreading, about 15; central spines usually 4; one of the centrals flattened, porrect, longer than the others, with a curved or hooked tip, about 4 cm. long; the other centrals subulate, somewhat angled; flowers rose-colored, 3.5 to 4 cm. long; outer perianth-segments ovate to ovate-oblong, acute; inner perianth-segments linear, acuminate; scales on the ovary broadly ovate; filaments pink; style and stigma-lobes greenish yellow to whitish.

Type locality: Not cited, but Mr. C. R. Orcutt's type specimen is labeled Lagoon Head, Lower California.

Distribution: Lower California.

Herbarium and living specimens of this species were obtained by Dr. Rose at San Bartolomé Bay, Lower California, in 1911 (No. 16188), some of which afterwards flowered in cultivation and were used in preparing the above description. The largest plants seen by him were up to about 4 dm. high, but the species may reach greater development.

Dr. Rose also collected this species at Abreojos Point, Lower California, March 16, 1911 (No. 16249). It is apparently common along the west coast of Lower California, usually growing at low elevations and as a rule forming the dominant feature of the landscape.

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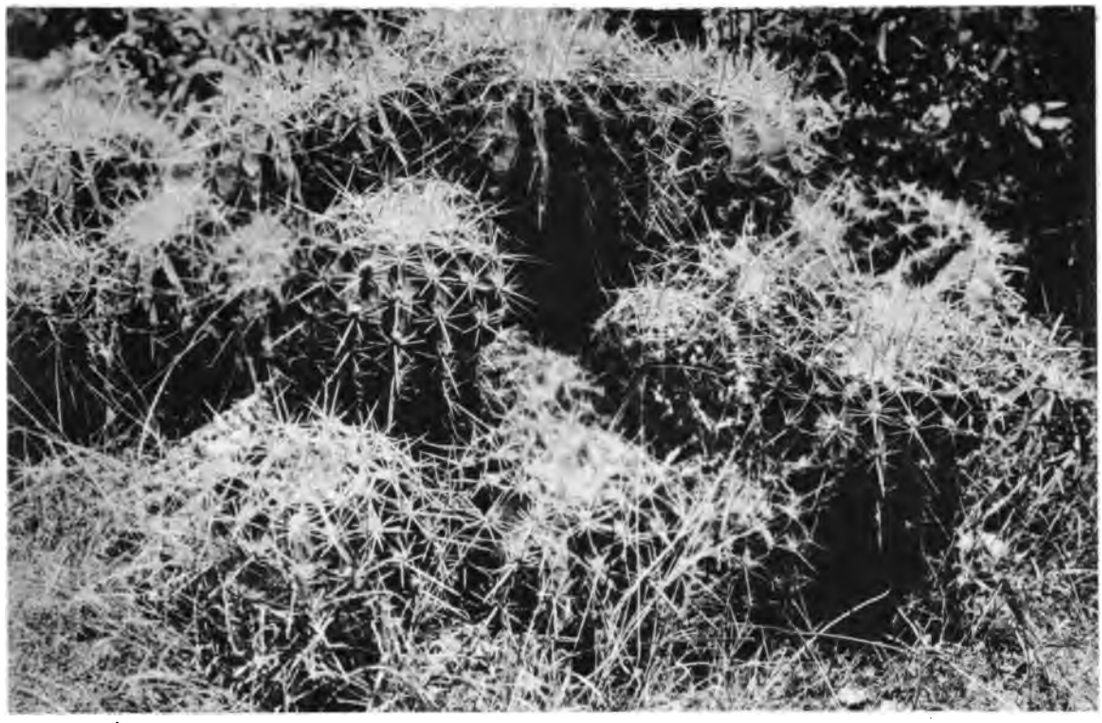

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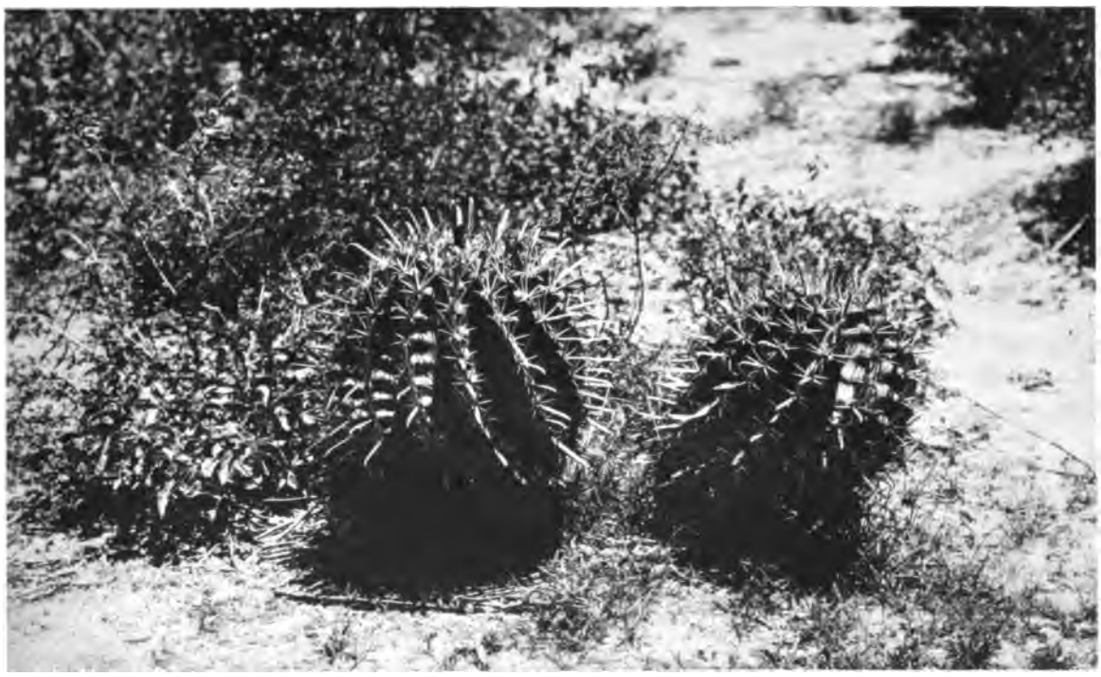


1. *Ferocactus flavovirens.*
2. *Ferocactus latispinus.*

The original reference to this species was very brief, as follows: "*E. fordii* is a name proposed for an allied form with ashy gray spines." The plant was later described by Mr. Orcutt (Rev. Cact. 2: 81. 1890) in detail and this fuller description was republished still later (West Amer. Sci. 13: 31. 1902). It was named for Lyman M. Ford of San Diego, California.

Illustration: Blühende Kakteen 1: pl. 11, as *Echinocactus fordii*.

Figure 132 is copied from the illustration above cited.

4. Ferocactus townsendianus sp. nov.

Short-cylindric, 4 dm. high or more; ribs about 16, often spiraled, somewhat undulate; areoles large, distant; radial spines widely spreading, 14 to 16, 3 to 4 cm. long, most of them thread-like, but often 2 or more above and below, subulate; central spines subulate, grayish, usually one curved or hooked at apex, the others straight, all annulate; flowers large, 5 to 6 cm. long; outer perianth-segments ovate, reddish, with narrow yellow margins; inner perianth-segments oblong-lanceolate with a narrow pink stripe down the center with greenish-yellow margins; filaments and style dark pink; stigma-lobes pale greenish brown.

Collected by J. N. Rose on San Josef Island, Gulf of California, March 15, 1911 (No. 16570).

This species is common near the coast, growing chiefly on the dry mesa along with desert shrubs.

This species is named for Dr. Charles H. Townsend, Director of the New York Aquarium, who was in charge of the scientific work of the *Albatross* during the cruise into Lower California waters in 1911, when this plant was discovered.

Plate XII, figure 1, shows the flowering type-plant sent by Dr. Rose to the New York Botanical Garden in 1911, where it immediately bloomed. Figure 133 is from a photograph of the same plant.

5. Ferocactus chrysacanthus (Orcutt).

Echinocactus chrysacanthus Orcutt, Rev. Cact. 1: 56. 1899.

Globose to cylindric; ribs about 18, tubercled; radial spines 4 to many, slender, white; central spines sometimes as many as 10, 5 cm. long, either red or yellow, curved; flowers from near the center of the plant, 5 cm. broad when fully open; scales naked in the axils, closely set and overlapping, the lower one orbicular and green, the upper ones more oval, brownish or with brown tips, the margin thin, sometimes ciliate or ragged; outer perianth-segments rather stiff, pinkish brown; inner perianth-segments 2 cm. long, satiny yellow with a jagged or toothed margin; fruit yellow, 3 cm. long; seeds large, black.

Type locality: Cedros Island, Lower California.

Distribution: Only on Cedros Island, and the adjacent coast of Lower California.

This plant is common on Cedros Island in the broad dry valleys which run back from the coast. It was re-collected by Dr. Rose at the type locality, in 1911. Dr. Rose obtained plants on Cedros Island about 2 dm. high, but we presume the plant becomes much larger.

According to C. R. Orcutt, "*E. rubrispinus* (Rev. Cact. 1:·56. 1899) is a name proposed by L. M. Ford for the red-spined form and so distributed"; otherwise we know nothing of it.

Echinocactus emoryi chrysacanthus (Schumann, Gesamtb. Kakteen Nachtr. 99. 1903) is a garden name and so far as we are aware is not published.

6. Ferocactus wislizeni (Engelmann).

Echinocactus wislizeni Engelmann in Wislizenus, Mem. Tour North. Mex. 96. 1848.
Echinocactus emoryi Engelmann in Emory, Mil. Reconn. 157. 1848.
Echinocactus wislizeni decipiens Engelmann in Rothrock, Rep. U. S. Geogr. Surv. 6: 128. 1878.
Echinocereus emoryi Rümpler in Förster, Handb. Cact. ed. 2. 804. 1885.
Echinocactus wislizeni albispinus Toumey, Gard. and For. 8: 154. 1895.
Echinocactus falconeri Orcutt, West Amer. Sci. 12: 162. 1902.
Echinocactus arizonicus Kunze, Monatsschr. Kakteenk. 19: 149. 1909.

At first globular but becoming cylindric, when very old much elongated, 2 meters long or more, usually simple, but when injured often giving off several heads or branches; ribs numerous, often 25, 3 cm. high; areoles elliptic, large, sometimes 2.5 cm. long, brown-felted, 2 to 3 cm. apart, or the flowering ones often approximate; spines variable; radials, absent in young plants, thread-like to acicular, the longest 5 cm. long; central spines several, white to red, annular, all subulate, one of them much stouter, usually strongly flattened, strongly hooked; flowers yellow, some red, 5 to 6 cm. long; fruit yellow, oblong, scaly, 4 to 5 cm. long; seeds dull black, the surfaces covered with shallow indistinct pits.

Type locality: Doñana, New Mexico.

Distribution: El Paso, Texas, west through southern New Mexico and Chihuahua to Arizona and Sonora and perhaps south along the Gulf of California into Sinaloa. Reported also from Utah, perhaps erroneously, and from Lower California.

A peculiar form was collected by J. W. Toumey at Dudleyville, Arizona, September 25, 1896. The spine-clusters lack the marginal bristles, the spines are shorter and the flowers smaller. Mr. Toumey says that it is quite different from *Echinocactus wislizeni.*

Echinocactus wislizeni latispinus (Schelle, Handb. Kakteenk. 168) is without description.

Echinocactus wislizeni purpureus is in the trade (Grässner).

Echinocactus sclerothrix Lehmann (Del. Sem. Hort. Hamb. 1838) is a very doubtful species; Schumann thought that it might be referred to *E. wislizeni;* if so, the name has priority.

Illustrations: Schelle, Handb. Kakteenk. 167. f. 97; Emory, Mil. Reconn. 157. No. 4; Gard. Chron. III. **8**: 159. f. 25; **35**: 181. f. 75; Rümpler, Sukkulenten 112. f. 62; Cact. Journ. **1**: pl. for March; July; Ann. Rep. Smiths. Inst. **1911**: pl. 6, A; Journ. Hort. Home Farm. III. **60**: 144; Monatsschr. Kakteenk. **14**: 185; **20**: 57; **30**: 19; Cact. Mex. Bound. pl. 25, 26; Pac. R. Rep. **4**: pl. 3, f. 1, 2; Hornaday, Campfires on Desert and Lava, facing 216; Plant World **9**: f. 47, 48; **11**[6]: f. 2; Förster, Handb. Cact. ed. 2. 510. f. 61; Gard. and For. **8**: 154. f. 24; Dict. Gard. Nicholson **4**: 541. f. 25; Suppl. 337. f. 362; Watson, Cact. Cult. 126. f. 49, as *Echinocactus wislizeni;* Monatsschr. Kakteenk. **19**: 151, as *Echinocactus arizonicus;* Saunders, Useful Wild Pl. opp. 158; Gard. Chron. II. **7**: 749. f. 119; Kunze, Cactaceae 1909, 1910, as *Echinocactus;* Emory Mil. Reconn. 157. No. 5, as *Echinocactus emoryi;* Contr. U. S. Nat. Herb. **16**: pl. 123, A, as *Echinocactus falconeri.*

Plate I is from a photograph taken by Dr. MacDougal near Pima Canyon, Arizona, in 1910; plate XII, figure 2, shows the flowering top of a plant sent by Dr. MacDougal to the New York Botanical Garden from Torres, Mexico, in 1902. Figure 131*a* is from a painting of *Ferocactus wislizeni* made for Dr. MacDougal, February 28, 1911.

7. Ferocactus horridus sp. nov.

Globular, 3 dm. in diameter or more; ribs 13, broad, 2 cm. high, obtuse, not tubercled; areoles 1.5 to 2.5 cm. apart, large; radial spines 8 to 12, acicular, spreading, white, 3 to 4 cm. long; central spines 6 to 8, very diverse, all reddish, either spreading or porrect, all straight except 1, this much elongated, often 12 cm. long, much flattened, very strongly hooked; flowers and fruit unknown.

Collected by J. N. Rose on San Francisquito Bay, Lower California, April 9, 1911 (No. 16746).

Only very small plants of this species were obtained by Dr. Rose during his hurried visit at this locality in 1911. Larger plants will doubtless be found in this same region. Indeed, Ivan M. Johnston has reported seeing a plant there of this relationship which was a meter high. This species, while most closely related to *F. wislizeni,* is much more strongly armed. It has, perhaps, the most formidable spine-armament of any species of this genus; the central spine is not so long as in No. 14, but is stouter and more strongly hooked.

M. E. Eaton del.

1. Flowering plant of *Ferocactus viridescens*.
2. Top of flowering plant of *Ferocactus rectispinus*.
(All natural size.)

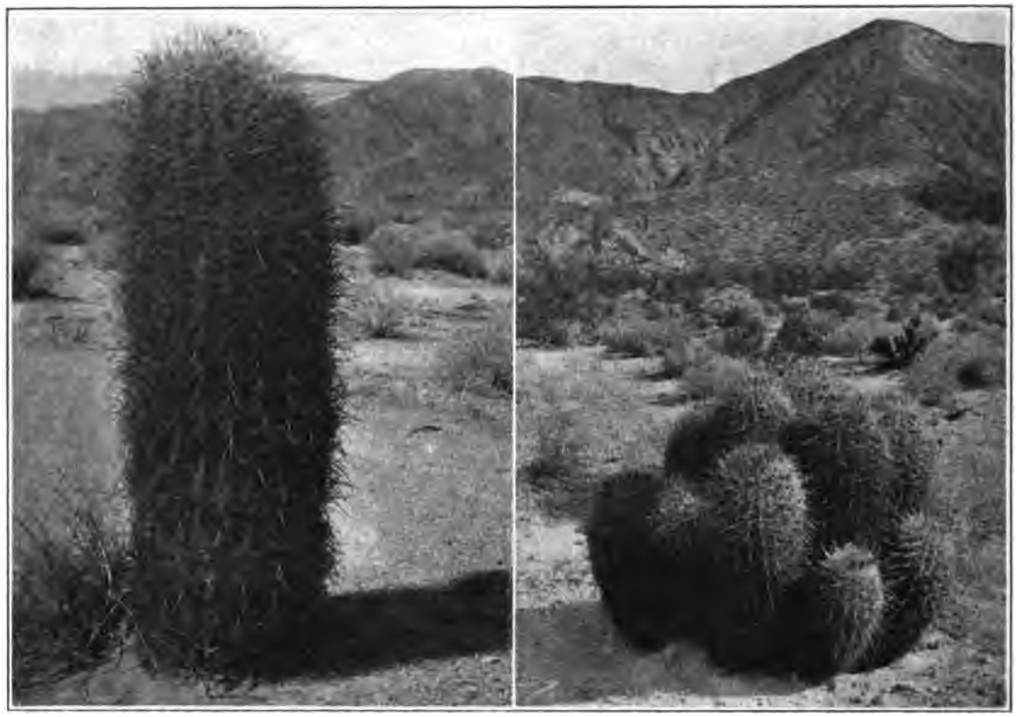
A Hoen & Co

Type locality: California.

Distribution: Deserts of southeastern California, northern Lower California, and southern Nevada.

Living plants from southern California, apparently referable to this species, do not have any bristle-like radial spines, and the stout spines vary greatly in color, from red to nearly white.

The range of this species seems not to be very extensive; Dr. Coulter records it from New Mexico and Texas but this must refer to *F. wislizeni*. It is nearest *F. wislizeni* but the spines are never hooked and the seeds are more shining, with stronger reticulations.



FIGS. 134 and 135.—Ferocactus acanthodes.

In America this species has long passed under the name of *Echinocactus cylindraceus*. The above name, however, is much older and we are following Weber in using it. Weber states that it has long been known as such in French collections and we believe that we are justified in taking up the older name.

It is also found in collections under the name of *E. californicus* and *E. copoldi* (Schumann, Gesamtb. Kakteen 357. 1898).

Echinocactus cylindraceus albispinus is in the trade (Grässner).

Illustrations: Garten-Zeitung **4**: 241. f. 54; 242. f. 55; Gard. Chron. II. 7: 241. f. 39; III. 8: 167. f. 27; Deutsche Gärt. Zeit. **5**: 209; Schelle, Handb. Kakteenk. 165. f. 95; West Amer. Sci. **7**: 68; Gartenwelt **9**: 249; Förster, Handb. Cact. ed. 2. 474. f. 55; Schumann, Gesamtb. Kakteen Nachtr. f. 18; Monatsschr. Kakteenk. **12**: 123; Cact. Journ. **2**: 115; Gartenflora **26**: pl. 905 b; **30**: 414; Cact. Mex. Bound. pl. 30; Ill. Gärt. Zeit. **21**: 65, as *Echinocactus cylindraceus;* Cact. Journ. **2**: pl. for February, as *Echinocactus cylindraceus longispinus.*

Plate XV shows two views of the Coachella Desert, three miles northeast of White Water, California, from a photograph taken by Dr. Wm. S. Cooper. Figure 134 is from a

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1, 2. *Ferocactus acanthodes* as seen in the Coachella Desert, California.

photograph taken by Dr. Wm. S. Cooper, between Indio and Palm Springs, California; figure 135 is from a photograph taken also by Dr. Cooper from the east base of the Laguna, May 12, 1919; figure 136 is from a photograph taken by Dr. MacDougal near Palm Springs, California, in 1913; figure 137 is from a photograph taken by S. C. Mason near Andreas Canyon, California, in 1918.

10. Ferocactus santa-maria sp. nov.

Cylindric, 6 dm. high or more; ribs about 14; outer spines several, thread-like; central spines in 2 series, all straight, grayish, all annulate, subulate, the central one stouter, flatter, ascending; somewhat curved at tip; old flowers persisting, 6 to 7 cm. long; fruit 3 to 4 cm. long, bearing orbicular scales; seeds 2 mm. long, finely reticulated.

Collected by J. N. Rose on the shores of Santa Maria Bay, Lower California, May 18, 1913 (No. 16279).

FIGS. 136 and 137.—Ferocactus acanthodes.

This plant was seen at only one locality and only small specimens were observed, but much larger ones may be expected. This is a densely armed plant, peculiar in having all the straight dagger-like strong central spines ascending.

According to letters from F. Vaupel, this plant has been in cultivation in Germany for several years, grown from seed, perhaps from the type collection. It is briefly mentioned in the Monatsschrift für Kakteenkunde (**29**: 13. 1919) as *Echinocactus santa-maria* Rose.

11. Ferocactus diguetii (Weber).

Echinocactus diguetii Weber, Bull. Mus. Hist. Nat. Paris **4**: 100. 1898.

Plants very stout, usually 1 to 2 meters, but sometimes 3 and 4 meters, high, 6 to 8 dm. in diameter or more; ribs numerous, sometimes as many as 39, rather thin; areoles large, 1 to 1.5 cm. long, somewhat elliptic, approximate or on old plants coalescent; spines 6 to 8, yellow, subulate, 3 to 4 cm. long, slightly curved and a little spreading; flowers numerous, 3 to 3.5 cm. long; scales on ovary and flower-tube ovate, closely imbricate, thin on the margin and somewhat lacerate; inner perianth-segments red with yellow margins, oblong, 2 cm. long; filaments pink, numerous; tube of flower below stamens very short; style yellow; fruit scaly.

Type locality: Santa Catalina Island, off Lower California.

Distribution: Islands of the Gulf of California.

This species which is common on several of the islands in the Gulf of California is perhaps the largest of all the visnagas or barrel cacti. On Santa Catalina Island, especially, enormous individuals are to be found and here it is the most conspicuous plant. It seems to have no very definite habitat, growing both on the mountain sides among the large igneous rocks as well as along the old shell beaches. These plants have an enormous display of surface roots with only a few weak supporting ones and consequently large plants can easily be toppled over. Its spines are all very much alike.

Mr. Ivan M. Johnston, botanist of the California Academy of Sciences' Expedition to the Gulf of California, who explored all the islands in the Gulf in 1921, writes of the distribution of this species, as follows: "I found the distribution of *Echinocactus diguetii* to be peculiar; I saw it at the following disconnected points: Angel de la Guardia, Carmen, Coronado, Dansante, and San Diego Islands. It seems to skip hither and thither over the Gulf Islands without rhyme or reason."

Illustrations: Bull. Mus. Hist. Nat. Paris **4**: 99. f. 1; Contr. U. S. Nat. Herb. **16**: pl. 123 B; Journ. N. Y. Bot. Gard. **12**: f. 47; Bull. Soc. Acclim. **52**: 53. f. 12, as *Echinocactus diguetii*.

Plate XI, figure 2, is from a photograph taken by Dr. Rose on Carmen Island, Gulf of California; plate XII, figure 3, shows the flower of a plant collected by Dr. Rose on Carmen Island in 1911.

12. Ferocactus covillei sp. nov.

Plant simple, globular to short-cylindric, often 1.5 meters high; ribs 22 to 32, 2 to 4 cm. high, rather thin, when young more or less tubercled, but when old hardly undulate; areoles on small plants distant, often 3 to 4 cm. apart, but on old and flowering plants approximate or contiguous, densely brown-felted when young, naked in age, the spine-bearing areoles large and circular; the flowering areoles more elongated and complex, divided into three parts, the lower part bearing spines, the central part spinescent glands, and the upper part the flower; spines variable as to color, sometimes red to white; radial spines 5 to 8, somewhat spreading, subulate, straight or more or less curved backward, 3 to 6 cm. long, annulate; central spine always solitary, very variable, straight or with the tip bent or even strongly hooked, annulate, terete to strongly flattened or 3-angled, 3 to 8 cm. long; upper areoles of old plants bearing 5 to 7 glands, becoming spinescent, 5 to 6 mm. long; flowers described as red, tipped with yellow, sometimes reported as yellow throughout, 6 to 7 cm. long; inner perianth-segments linear-oblong, acuminate, often serrate; throat broad, covered with stamens; tube-proper short, 2 to 3 mm. long; fruit oblong, 5 cm. long, bearing a few broad scales; seeds black, dull or shining, nearly smooth or slightly pitted, 2 mm. long.

Collected on hills and mesas near Altar, Sonora, Mexico, by C. G. Pringle, August 11, 1884 (type), by Rose, Standley, and Russell on plain near Empalme, Sonora, March 11, 1910 (No. 12642), and by F. V. Coville, 10 miles west of Torres, Sonora, February 10, 1903 (No. 1657).

This species ranges from southern Arizona to Guaymas, Sonora. It has heretofore passed as *Echinocactus emoryi;* the type of that species, however, came from southwestern New Mexico and has been referred by us as a synonym of *Ferocactus wislizeni.* Dr. Engelmann in his synopsis of the Cactaceae and in his later references transferred the name *emoryi* to the plant here described. This species needs further study; the color of the flowers is not definitely known and there is considerable variation in the markings of the seeds. The species as here considered has a wide range altitudinally and may include more than one species. We have reluctantly referred here two specimens (Nos. 4154 and 4155), collected by J. C. Blumer from the Comobabi Mountains, Arizona.

From this and related species water is often obtained by travelers in the great deserts of western Mexico and the southwestern United States. This has been described and illustrated by Dr. F. V. Coville in an article "Desert Plants as a Source of Drinking Water." He tells how by slicing off the top of a large plant and mashing the pulp three quarts of drinkable water were obtained (Ann. Rep. Smiths. Inst. **1903**: 499 to 505. 1904).

In Mexico a candy is made from the flesh of this and other large species. The spines and epidermis are all cut off; the flesh is cut into slices of various shapes and sizes and then cooked in sugar. This candied product is sold in all the towns and markets of Mexico.

Illustrations: Journ. N.Y. Bot. Gard. **3**: 95. f. 14, as *Cereus* sp.; Carnegie Inst. Wash. **6**: pl. 18; MacDougal, Bot. N. Amer. Des. pl. 8, 62; Monatsschr. Kakteenk. **25**: 93; Nat. Geogr. Mag. **21**: 712; Amer. Gard. **11**: 459; Möllers Deutsche Gärt. Zeit. **25**: 474. f. 6, No. 25; Schelle, Handb. Kakteenk. 161. f. 90; Dict. Gard. Nicholson **4**: 539. f. 20; Suppl.

354. f. 335; Gard. Chron. III. 35: 181. f. 76; Engler and Prantl, Pflanzenfam. 3^{6a}: f. 56, D; Strand Mag. 626, 627; Goebel, Pflanz. Schild. 1: f. 47; Förster, Handb. Cact. ed. 2. 208. f. 16; Ann. Rep. Smiths. Inst. 1903: 500. f. 1; pl. 1, 2; Cact. Mex. Bound. pl. 28; Pac. R. Rep. 4: pl. 3, f. 3; Watson, Cact. Cult. 101. f. 34; ed. 3. 52. f. 22, as *Echinocactus emoryi;* Bull. Geol. Surv. 613: pl. 38 A, without name.

Figure 138 is from a photograph of the plant, taken by F. E. Lloyd in the Quijotoa Mountains, Arizona, in 1906; figure 139 is from a photograph taken by Dr. MacDougal near Torres, Sonora, in 1903.

FIGS. 138 and 139.—Ferocactus covillei.

13. Ferocactus peninsulae (Weber).

Echinocactus peninsulae Weber, Bull. Mus. Hist. Nat. Paris 1: 320. 1895.

Simple, erect, 2.5 meters high, clavate to cylindric; ribs 12 to 20, prominent; areoles 4 cm. apart or even less in old plants; spines red with yellow tips; radial spines 11, spreading, straight, terete, more or less annulate, the lower ones stouter and more colored; central spines 4.

Type locality: Lower California, but no definite locality cited.

Distribution: Southern Lower California.

Engelmann and Weber seemed to have been in agreement regarding this species being new, but Engelmann's name (Contr. U. S. Nat. Herb. 3: 361. 1896) was based on Gabb's specimen (No. 11), now preserved in the Missouri Botanical Garden, while Weber's name is based on Diguet's plant. The plants of these two collections may or may not be conspecific. We have seen only Engelmann's specimen which we have used in making our illustration.

In December 1920, Dr. William S. W. Kew sent us fruit and a small living plant from near Boca de Guadalupe on the west coast of Lower California which we believe belongs here. His plant is less than 10 cm. high with 8 broad ribs; young areoles brown-felted, circular; radial spines spreading, brownish or white; central spines 4, grayish brown, the lower one flattened, strongly hooked, annulate; flowers yellow; fruit yellowish, 2.5 cm. long, bearing broad rounded scales; seeds 2 mm. long, reticulate. The plant is known as

bisnaga or visnaga, as are also other species of this relationship. Dr. Kew states that the Mexicans on the peninsula of Lower California often cut off the spines of this plant and use it as feed for cattle.

Illustrations: Bull. Mus. Hist. Nat. Paris **4**: 101; Bull. Soc. Acclim. **52**: f. 11; Möllers Deutsche Gärt. Zeit. **25**: 474. f. 10, as *Echinocactus peninsulae.*

Figure 140 shows the spines of a specimen in the Engelmann herbarium collected by William M. Gabb in Lower California.

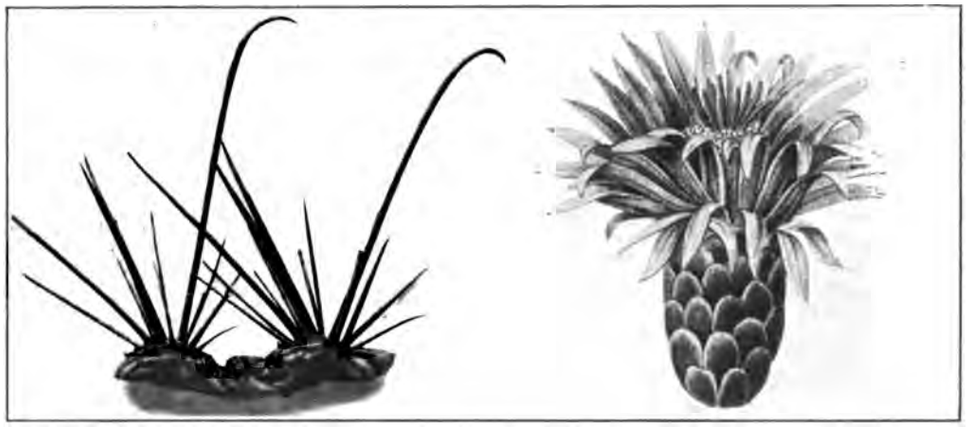


FIG. 140.—Ferocactus peninsulae.

FIG. 141.—Ferocactus robustus.

14. Ferocactus rectispinus (Engelmann).

Echinocactus emoryi rectispinus Engelmann in Coulter, Contr. U. S. Nat. Herb. **3**: 362. 1896.
Echinocactus rectispinus Britton and Rose, Journ. N. Y. Bot. Gard. **12**: 269. 1911.

Globose to cylindric, 1 to 2 meters high; radial spines 8 to 12, the three upper spines stouter and sometimes curved; central spine one, 9 to 13 cm. long (not 30 to 32 cm. long), rather slender, nearly straight, never hooked; flowers 6 cm. long, yellowish; scales on ovary rounded, thin-margined, sometimes ciliate, naked in the axils; inner perianth-segments lemon-yellow, lanceolate, 5 cm. long, acuminate.

Type locality: Vicinity of Muleje, Lower California.

Distribution: Central Lower California.

This species was described as a variety of *Echinocactus emoryi* (*i. e. Ferocactus covillei*) by Dr. Coulter, but it seems distinct, especially in its spines.

Mr. C. H. Thompson in Bailey's Cyclopedia of American Horticulture assigned it to the southern United States, but this is erroneous.

The type is Gabb's No. 12, from Lower California. It consists of two clusters of spines and is now deposited in the herbarium of the Missouri Botanical Garden.

Palmer's specimen from Sonora, referred here by Coulter, may be *F. wislizeni.*

Illustrations: Cycl. Amer. Hort. Bailey **2**: 513. f. 745, as *Echinocactus emoryi rectispinus;* Stand. Cycl. Hort. Bailey **2**: f. 1372, as *Echinocactus rectispinus.*

Plate XIV, figure 2, shows the flowering top of a plant sent by Dr. Rose from the head of Concepción Bay, Lower California, to the New York Botanical Garden in 1911. Figure 142 is from a photograph of the type specimen obtained by William M. Gabb in 1867 (No. 12).

15. Ferocactus orcuttii (Engelmann).

Echinocactus orcuttii Engelmann, West Amer. Sci. **2**: 46. 1886.

Single, or cespitose in clusters of 15 to 20 stems, 6 to 13 dm. high, 2.5 to 4.5 dm. in diameter; ribs 13 to 30, somewhat spiraled, obtuse, somewhat tuberculate; areoles approximate; spines reddish, straight or simply curved, all annulate, angled or flat; radial spines 9 to 13, spreading; central spines 4, stouter than the radials; flower 3 to 5 cm. long, dull crimson; perianth-segments short-oblong,

rounded at apex with a more or less erose-margin; scales on the ovary orbicular, small; stigma-lobes 16 to 20, green; fruit described as pulpy, crimson, scaly; seeds numerous, small.

Type locality: Palm Valley, Lower California.

Distribution: Definitely known only from type locality. Recorded from San Diego.

Palm Valley is not shown on ordinary maps. We wrote to Mr. E. C. Rost who recently returned from northern Lower California to locate the place and he writes as follows: "Palm Valley is about 40 miles southeast of Tia Juana, and is probably not noted on any of the maps as it is not a pueblo, but merely the watershed of the Rio Tia Juana." He subsequently visited Palm Valley and sent us two plants, neither of them quite agreeing with the descriptions of the species.

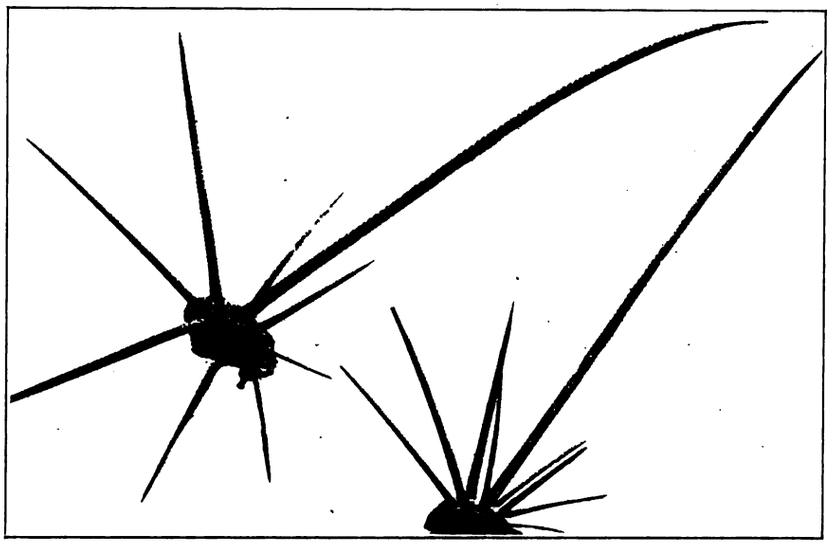


FIG. 142.—Ferocactus rectispinus.

We know this plant only from descriptions and illustrations. After our manuscript was in type Mr. C. R. Orcutt wrote us as follows: "You know, I suppose that I consider *Echinocactus orcuttii* only a luxuriant development of *E. viridescens?* At Palm Valley, Lower California, I have seen it very large and one cluster contained 25 heads, forming quite a large mass. I found one large cristate." The published illustrations do not indicate close relationship with *F. viridescens.*

Illustrations: West Amer. Sci. 2: 47; 7: 69; Schelle, Handb. Kakteenk. 166. f. 96; Blanc, Cacti 49. f. 575, as *Echinocactus orcuttii.*

16. Ferocactus robustus (Link and Otto).

Echinocactus robustus Link and Otto, Allg. Gartenz. 1: 364. 1833.
Echinofossulocactus robustus Lawrence in Loudon, Gard. Mag. 17: 318. 1841.

In large clumps, often 3 meters, rarely 5 meters, in diameter, 1 to 1.3 meters high, with hundreds of branches; ribs 8, prominent in young growth, but becoming indistinct in age, somewhat undulate; areoles brown-felted when young; radial spines ascending, about 10, often thread-like; central spines subulate, about 6, brown at first, somewhat flattened, annulate, often 6 cm. long; flowers 3.5 to 4 cm. long; inner perianth-segments oblong, acute, yellowish; scales on the ovary broad, rounded at tip; fruit 2 to 2.5 cm. long; seeds black, oblong, 1.5 mm. long.

Type locality: Mexico.

Distribution: Tehuacán, Puebla, Mexico.

The large mounds formed by this plant are striking features of the landscape; the individual heads are globose or short-oblong, 1 to 2 dm. in diameter.

Echinocactus robustus prolifer (Pfeiffer, Enum. Cact. 61. 1837) to which *Echinocactus agglomeratus* Karwinsky was assigned as a synonym seems to be the normal form of the species, while var. *monstrosus* (Pfeiffer, Enum. Cact. 61. 1837) is an abnormal form. To it were referred also as synonyms *Echinocactus spectabilis* and *E. subuliferus* (Pfeiffer, Enum. Cact. 61. 1837). This latter name, according to Pfeiffer, is different from *E. subuliferus* Link and Otto (Verh. Ver. Beförd. Gartenb. 3: 427. pl. 27. 1827) collected in Mexico by Deppe. The flowers and fruit were unknown.

Illustrations: Nov. Act. Nat. Cur. 19: pl. 16, f. 3, 6; Contr. U. S. Nat. Herb. 10: pl. 16, f. A; Möllers Deutsche Gärt. Zeit. 25: 474. f. 6, No. 9; 29: 441. f. 17; Karsten and Schenck, Vegetationsbilder 1: pl. 44, as *Echinocactus robustus;* Verh. Ver. Beförd. Gartenb. 3: pl. 27, as [*Echinocactus*] *subuliferus*.

Figure 141 shows the flower, copied from the first illustration above cited. Figure 143 is from a photograph of the plant taken by Dr. Rose at El Reago, Puebla, Mexico, in 1905.

FIG. 143.—Ferocactus robustus.

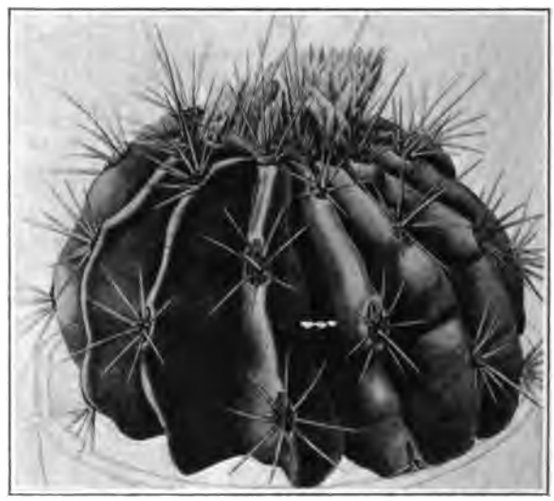


FIG. 144.—Ferocactus echidne.

17. Ferocactus echidne* (P. De Candolle).

Echinocactus echidne P. De Candolle, Mém. Cact. 19. 1834.
Echinocactus vanderaeyi Lemaire, Cact. Aliq. Nov. 20. 1838.
Echinocactus dolichacanthus Lemaire, Cact. Aliq. Nov. 25. 1838.
Echinofossulocactus vanderaeyi Lawrence in Loudon, Gard. Mag. 17: 318. 1841.
Echinofossulocactus vanderaeyi ignotus-longispinus Lawrence in Loudon, Gard. Mag. 17: 318. 1841.
Echinofossulocactus echidne Lawrence in Loudon, Gard. Mag. 17: 318. 1841.
Echinocactus gilvus Dietrich, Allg. Gartenz. 13: 170. 1845.
Echinocactus echidne gilvus Salm-Dyck, Cact. Hort. Dyck. 1849. 27. 1850.
Echinocactus victoriensis Rose, Contr. U. S. Nat. Herb. 12: 291. 1909.

Depressed-globose, 12.5 cm. high, 18 cm. in diameter, green; ribs 13, acute, broad at base; areoles remote, velvety when young, oval in shape; radial spines rigid, about 7, about 2 cm. long, yellow; central spine solitary, porrect, 3 cm. long or more; flowers lemon-yellow; perianth-segments linear-oblong, acute, sometimes toothed near the apex; stigma-lobes about 10, elongated, spreading or reflexed; scales on the ovary ovate, acute.

Type locality: Mexico.

Distribution: Hidalgo, Mexico.

Echinocactus dolichocentrus Salm-Dyck (Cact. Hort. Dyck. 1844. 22. 1845) is usually referred here as a synonym but it was never described.

Illustrations: Blühende Kakteen 3: pl. 146; Schelle, Handb. Kakteenk. 156. f. 83; De Candolle, Mém. Cact. pl. 11, as *Echinocactus echidne*.

Figure 144 is copied from the last illustration above cited.

*Schumann has changed the spelling of this name to *E. echidna*.

18. Ferocactus alamosanus Britton and Rose.

Echinocactus alamosanus Britton and Rose, Contr. U. S. Nat. Herb. 16: 239. 1913.

Plants usually single, sometimes in clusters, somewhat flattened above, green, 30 cm. in diameter or more; ribs about 20, narrow; spines all yellow; radials usually 8, 3 to 4 cm. long, more or less spreading; central single, porrect or erect, somewhat flattened laterally, 6 cm. long and a little longer than the radials; flower-buds covered with ovate, ciliate scales, these brownish except in the margin; fruit unknown.

Type locality: Alamos Mountain, Mexico.

Distribution: Southern Sonora, Mexico.

This species is quite unlike anything we have yet seen from the west coast of Mexico. A small living plant of the type collection was brought to Washington by Dr. Rose in 1910, but is still quite small, being only 10 cm. in diameter. It has now been sent to Mr. Wm. Hertrich, superintendent of the Huntington Estate near Los Angeles, where it will be planted in the open and given a chance to develop. The illustration cited below was made from this plant.

Mr. Ivan M. Johnston has collected this species or a closely related one on the hill-sides about San Carlos Bay, Sonora (No. 4348). He says that it is 6 dm. high, 5 dm. in diameter and has 23 ribs. He describes the flower as clear lemon-yellow with the outer segments greenish red at tip; the scales on the ovary are broadly ovate, apicular, ciliate.

Illustration: Contr. U. S. Nat. Herb. **16**: pl. 66, as *Echinocactus alamosanus*.

Figure 145 is from a photograph of the living plant collected by Dr. Rose.

FIG. 145 —Ferocactus alamosanus.

19. Ferocactus glaucescens (De Candolle).

Echinocactus glaucescens De Candolle, Mém. Mus. Hist. Nat. Paris 17: 115. 1828.
Echinocactus pfeifferi Zuccarini in Pfeiffer, Enum. Cact. 58. 1837.
Echinofossulocactus pfeifferi Lawrence in Loudon, Gard. Mag. 17: 318. 1841.

Globular, 2 to 4 dm. in diameter, or a little higher than broad, glaucous; ribs 11 to 15, somewhat flattened, acute, 2 to 3 cm. high; areoles 8 to 12 mm. apart, oblong, 12 to 20 cm. long, yellowish, tomentose when young; radial spines 6, nearly equal, rigid, only slightly spreading, straight, 2.5 to 3 cm. long, pale yellow at first, when old blackish, more or less banded; central spine solitary, similar to the radials; flowers yellow, 2 cm. long, perhaps broader when fully expanded; outer perianth-segments ovate, acuminate, sometimes brownish on the back, ciliate on the margins; inner perianth-segments oblong, usually only acute, somewhat toothed or lacerate; stigma-lobes slender, cream-colored; scales on the ovary brownish, ovate, acute, ciliate on the margins, imbricate.

Type locality: Toliman, Mexico.

Distribution: Eastern central Mexico.

Our knowledge of this species is drawn not only from illustrations and published descriptions but also from a plant obtained by Dr. Rose from Hidalgo, Mexico, in 1915, which has since been grown in the cactus house of the U. S. Department of Agriculture, but has never flowered. Dr. Rose, however, found it in flower at La Mortola, Italy, in 1912, and a few flowers were obtained.

Schumann thought that *Echinocactus dietrichianus* Förster (Hamb. Gartenz. 17: 160. 1861) was probably referable to *E. pfeifferi*.

Schumann refers here *E. theionacanthus* Lemaire (Cact. Aliq. Nov. 22. 1838) and *E. theiacanthus* Lemaire (Cact. Gen. Nov. Sp. 86. 1839) but he has the names interchanged. The latter seems to have been based on *E. mammilifer* Miquel (Linnaea 12: 8. 1838),

a name which Schumann listed among his unknown species. Hemsley (Biol. Centr. Amer. Bot. 1: 536. 1880) refers here *E. mammillarioides* Hooker, a different plant, native of Chile. Although there are some slight differences in the descriptions it is not at all unlikely that these last two species had a common origin, the names being similar and published about the same time. It is almost certain that all four names should be excluded from this species. For a description of *E. mammillarioides* see *Malacocarpus* page 203.

Illustrations: Pfeiffer, Abbild. Beschr. Cact. 2: pl. 2; Abh. Bayer. Akad. Wiss. München 2: (see p. 739) pl. 3, f. 6; (see p. 740) pl. 5, sec. 1, f. 1 to 5, as *Echinocactus pfeifferi*.

20. Ferocactus flavovirens (Scheidweiler).

Echinocactus flavovirens Scheidweiler, Allg. Gartenz. 9: 50. 1841.

Plant cespitose, forming great masses, pale green, 3 to 4 dm. high; stems 1 to 2 dm. in diameter; ribs 13, rarely 11 or 12, 1 to 2 cm. high, acute, somewhat sinuate; areoles 2 cm. apart, large, grayish, woolly; spines pale brown, becoming gray in age, long and stout; centrals 4, much longer than the radials, somewhat unequal, the longer ones 5 to 8 cm. long; flowers and fruit not seen; flower-buds globular, covered with long linear imbricating scales, their margins with long ciliate hairs.

Type locality: Tehuacán, Mexico.

Distribution: Known only from about Tehuacán, Puebla, Mexico.

This species was introduced into cultivation from the type locality by Dr. Rose in 1906 but it has never flowered. It grows with *F. robustus* and may easily be mistaken for it, but the color of the stems, number of ribs, and color of spines are quite different.

Here is referred *Echinocactus polyocentrus* Lemaire (Salm-Dyck, Cact. Hort. Dyck. 1844. 22. 1845), but unpublished.

The Index Kewensis refers *E. flavovirens* to *E. orthacanthus* Link and Otto (Verh. Ver. Beförd. Gartenb. 3: 427. 1827; *Melocactus orthacanthus* Link and Otto, Verh. Ver. Beförd. Gartenb. 3: pl. 18. 1827), a much earlier name, but the description suggests a very different plant, with 17 ribs and one stout central spine. The original description states definitely that it comes from Montevideo, but the Index Kewensis refers it to Mexico.

Illustrations: MacDougal, Bot. N. Amer. Des. pl. 18; Nat. Geogr. Mag. 21: 700, as *Echinocactus flavescens*.

Plate XIII, figure 1, is from a photograph taken by Dr. MacDougal near Esperanza, Puebla, in 1900.

21. Ferocactus melocactiformis (De Candolle).

Echinocactus melocactiformis De Candolle, Prodr. 3: 462. 1828.
Echinocactus histrix De Candolle, Mém. Mus. Hist. Nat. Paris 17: 115. 1828.
Echinocactus coulteri G. Don, Gen. Syst. 3: 162. 1834.
Echinocactus oxypterus Zuccarini in Pfeiffer, Enum. Cact. 57. 1837.
Echinocactus electracanthus Lemaire, Cact. Aliq. Nov. 24. 1838.
Echinocactus lancifer Reichenbach in Terscheck, Cact. Suppl. 2.
Echinofossulocactus oxypterus Lawrence in Loudon, Gard. Mag. 17: 318. 1841.
Echinocactus electracanthus capuliger Monville in Labouret, Monogr. Cact. 184. 1853.

Simple, cylindric, 5 to 6 dm. in diameter, bluish green; ribs about 24; areoles 2 to 3 cm. apart; spines usually 10 to 12, a little curved, yellow, becoming brown, of these 6 to 8 slender-subulate, 2 to 3 cm. long, more or less spreading; 3 or 4 spines more central than the others, but usually only one definitely so, much stouter and longer, 4 to 6 cm. long, porrect or ascending, annulate; flowers 2.5 to 3.5 cm. long, bright yellow, sometimes reddish without; inner perianth-segments linear-oblong, acute, somewhat spreading; stigma-lobes 6, linear, green; scales on the ovary ovate, acute, small, 2 to 4 mm. long, somewhat ciliate; fruit short-oblong, about 2 cm. long, somewhat edible; seeds minute, 1 mm. long, brown.

Type locality: Mexico.

Distribution: Eastern Mexico.

The numerous thin ribs of this plant, as shown in the original illustration, resemble those of some species of *Echinofossulocactus*, but its flowers appear to be like those of *Ferocactus*.

Echinocactus pfersdorffii Hortus may be referable here. It is probable that *E. pfersdorffii* Hildmann Catalogue (Monatsschr. Kakteenk. 5: 92. 1905) is the same, but neither was accompanied by a description.

In cultivation this plant is simple, depressed-globose, 4.5 dm. in diameter, but in the wild state sometimes cylindric and up to 6 dm. high, and described as proliferous; ribs 20, perhaps even more, acute; areoles rather large, distant; radial spines usually 8, subulate, somewhat curved, 4.5 cm. long; central spines usually solitary, but as many as 4 reported, all yellow.

We have followed Schumann in referring here various synonyms, but the indications are that we have more than one species. Dr. Rose obtained flowers of this species at La Mortola in 1912 and his notes were used in drawing up the description.

Here belongs *Cactus multangularis* Mociño and Sessé (Mém. Mus. Hist. Nat. Paris 17: 38. 1828), but never described by them. *Echinocactus electracanthus rufispinus* (Monatsschr. Kakteenk. 3: 70. 1893) we would also refer here.

Echinocactus hystrichacanthus Lemaire (Cact. Gen. Nov. Sp. 17. 1839) may be of this relationship. This species as well as *E. pycnoxyphus* Lemaire (Cact. Gen. Nov. Sp. 16. 1839) Weber considered as only varieties of *E. hystrix*.

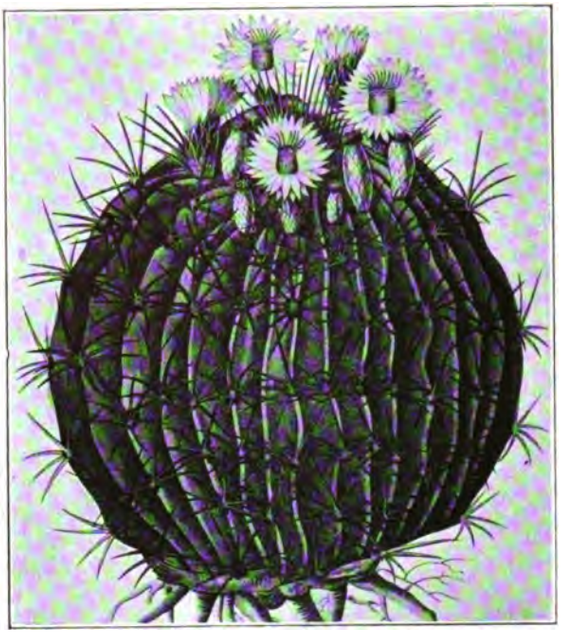


FIG. 146.—Ferocactus melocactiformis.

Illustrations: De Candolle, Mém. Mus. Hist. Nat. Paris 17: pl. 10, as *Echinocactus melocactiformis;* Monatsschr. Kakteenk. 3: 158. f. 2; 21: 171; Schumann, Gesamtb. Kakteen f. 58, as *Echinocactus electracanthus;* Blühende Kakteen 1: pl. 22, as *Echinocactus ingens*.

Figure 146 is copied from the first illustration above cited.

22. Ferocactus macrodiscus (Martius).

Echinocactus macrodiscus Martius, Nov. Act. Nat. Cur. 16; 341. 1832.
Echinocactus macrodiscus laevior Monville in Labouret, Monogr. Cact. 197. 1853.
Echinocactus macrodiscus decolor Monville in Labouret, Monogr. Cact. 197. 1853.
Echinocactus macrodiscus multiflorus R. Meyer, Monatsschr. Kakteenk. 24: 150. 1914.

Simple, depressed-globose or sometimes short-cylindric, sometimes 4.5 dm. in diameter; ribs 16, perhaps more in some specimens, somewhat flattened, sometimes acute on the margin, somewhat depressed at the distant areoles; spines all yellow, more or less curved backward; radial spines 6 to 8, mostly 2 to 3 cm. long; central spines 4, stouter and flatter than the radials, 3.5 cm. long; flowers 5 cm. long, dark red to purple, obconic; inner perianth-segments linear-oblong, acute; stamens and style included.

Type locality: Not definitely cited but probably on the Cumbre at about 10,000 feet, in a place called El Renosco, Mexico.

Distribution: San Luis Potosí and southward.

We do not know this species definitely although it is supposed to have a rather wide distribution in Mexico. The only specimen which we can refer with any confidence is one obtained through Professor Conzatti in 1910 from Oaxaca, Mexico.

The plant illustrated in Blühende Kakteen as cited below has flowers of different color and shape, and hence is referred here with some doubt.

Schumann (Gesamtb. Kakteen 349. 1898), following Labouret, refers as a synonym of this species *E. campylacanthus* Scheidweiler (Allg. Gartenz. 8: 337. 1840), which is described as having 21 ribs and only one central spine. It should probably be referred elsewhere. The specimens distributed by de Laet under this name seem to be *Echinopsis leucantha*.

Illustrations: Nov. Act. Nat. Cur. 16: pl. 26; Blühende Kakteen 3: pl. 134; Schelle, Handb. Kakteenk. 162. f. 92; Gard. Chron. III. 50: 135. f. 64, E, as *Echinocactus macrodiscus;* Monatsschr. Kakteenk. 24: 151, as *Echinocactus macrodiscus multiflorus*.

Figure 147 is copied from the first illustration above cited.

FIG. 147.—Ferocactus macrodiscus.

23. Ferocactus viridescens (Torrey and Gray).

Echinocactus viridescens Torrey and Gray, Fl. N. Amer. 1: 554. 1840.
Melocactus viridescens Nuttall in Teschemacher, Bost. Journ. Nat. Hist. 5: 293. 1845.
Echinocactus limitus Engelmann in Coulter, Contr. U. S. Nat. Herb. 3: 374. 1896.

At first nearly globose or somewhat depressed, in age becoming cylindric, 3 to 4.5 dm. high, 2.5 to 3.5 dm. in diameter, simple or cespitose, deep green, somewhat glossy; ribs 13 to 21, somewhat rounded, 1 to 2 cm. high, obtuse, undulate; areoles narrow, elliptic, 1 to 2 cm. long, spine-bearing in the lower part, felted in upper part, flower-bearing and also with several reddish glands, these becoming elongated and spinescent in age; spines at first bright red, becoming duller by age or turning yellow or horn-colored; radial spines 9 to 20, more or less spreading, 1 to 2 cm. long; central spines 4, the lower one stouter and more flattened, up to 3.5 cm. long; flowers yellowish green, 4 cm. long; perianth-segments oblong, obtuse, sometimes apiculate, more or less serrulate on the margins; flower-tube bearing stamens almost to the top of the ovary; scales on the ovary orbicular, imbricate; fruit 1.6 to 2 cm. long, reddish with a pleasant acid taste; seeds 1.6 mm. long, pitted.

Type locality: Near San Diego, California.

Distribution: California and Lower California near the International Boundary Line, not far from the sea coast and in the foothills.

Echinocactus viridescens is usually credited to Nuttall, but he referred it in manuscript to *Melocactus*, and Torrey and Gray, who revised and published his manuscript, referred it doubtfully to *Echinocactus*.

Echinocactus californicus Monville (Labouret, Monogr. Cact. 199. 1853), first grown from seed supposed to have come from California, but without definite locality, may belong here although it has been referred to other species such as *F. orcuttii*. *E. californicus* Hortus is referred here by Rümpler (Förster, Handb. Cact. ed. 2. 472. 1885).

Illustrations: Gard. Chron. II. 7: 172. f. 26; Cact. Mex. Bound. pl. 29, as *Echinocactus viridescens*.

Plate XIV, figure 1, shows a flowering plant sent to the New York Botanical Garden from southern California by W. T. Schaller in 1909. Figure 148 is from a photograph of plants collected by C. R. Orcutt in southern California in 1917.

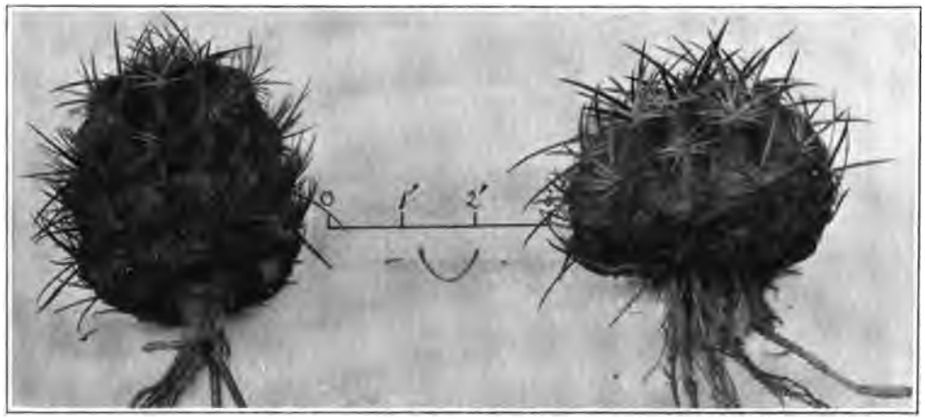


FIG. 148.—Ferocactus viridescens.

24. Ferocactus johnsonii (Parry).

Echinocactus johnsonii Parry in Engelmann, Bot. Kings's Surv. 117. 1871.
Echinocactus johnsonii octocentrus Coulter, Contr. U. S. Nat. Herb. 3: 374. 1896.

Simple, oblong, 10 to 20 cm. high, up to 11.5 cm. in diameter, often hidden under its mass of spines; ribs 17 to 21, low, somewhat tuberculate; spines reddish gray; radial spines 10 to 14, spreading, 10 to 20 mm. long; central spines 4 to 8, longer and stouter than the radials, somewhat curved, the upper ones connivent, 3.5 to 4 cm. long; flowers deep red to pink, 5 to 6.5 cm. long, sometimes 10 cm. broad when fully expanded; inner perianth-segments oblong to spatulate, obtuse; ovary bearing a few broad, scarious, fimbriate, margined scales; fruit oblong, 10 to 15 cm. long, nearly naked; seeds finely reticulated.

Type locality: Near St. George, Utah.

Distribution: Northwestern Arizona, eastern California, western Utah, and southern Nevada.

This species was named for Joseph Ellis Johnson (1817–1882), an amateur botanist of St. George, Utah, who, according to Professor Vasco M. Tanner, was once awarded a gold medal for having the best garden in the state of Utah.

Illustrations: Förster, Handb. Cact. ed. 2. 558. f. 71; Schelle, Handb. Kakteenk. 202. f. 134; Cact. Journ. 1: pl. 5; Deutsche Gärt. Zeit. 7: 53; Gartenflora 32: 58, as *Echinocactus johnsonii*.

Figure 149 (single plants in foreground) is from a photograph taken by M. E. Jones at Searchlight, Nevada, April 1907.

25. Ferocactus nobilis (Linnaeus).

Cactus nobilis Linnaeus, Mantissa 243. 1767.
Cactus recurvus Miller, Dict. Gard. ed. 8. No. 3. 1768.
Echinocactus recurvus Link and Otto, Verh. Ver. Beförd. Gartenb. 3: 426. 1827.
Melocactus recurvus Link and Otto, Verh. Ver. Beförd. Gartenb. 3: pl. 20. 1827.
Echinocactus spiralis Karwinsky in Pfeiffer, Enum. Cact. 60. 1837.

Echinocactus curvicornis Miquel, Linnaea 12: 5. 1838.
Echinocactus stellatus Scheidweiler, Allg. Gartenz. 8: 338. 1840.
Cereus recurvus Steudel, Nom. ed. 2. 1: 335. 1840.
Echinocactus solenacanthus Scheidweiler, Allg. Gartenz. 9: 50. 1841.
Echinofossulocactus recurvus campylacanthus Lawrence in Loudon, Gard. Mag. 17: 318. 1841.
Echinocactus recurvus spiralis Schumann, Gesamtb. Kakteen 348. 1898.

Globular; ribs 15; radial spines straight, widely spreading; central spine solitary, erect, 7 cm. long, broad and flat, recurved at the tip, brownish red; flowers 2.5 to 4 cm. long; perianth-segments narrow, acute, red with white margins; ovary covered with ovate imbricated scales; fruit short, oblong, 2 cm. long, 12 mm. in diameter.

Type locality: Mexico.

Distribution: Eastern Mexico.

This species is referred both to Mexico and Peru. It is undoubtedly from eastern Mexico for it is based on *Cactus recurvus* of Miller. In the original description Miller thus speaks of it, "The third sort was brought into England by the late Dr. William Houston who procured the plant from Mexico." We do not know this species definitely, but plants collected by Dr. MacDougal and Dr. Rose in Tomellín Canyon, Oaxaca, answer the description, but have flowers up to 4 cm. long.

FIG. 149.—Ferocactus johnsonii.

FIG. 150.—Ferocactus nobilis.

We have referred here the synonymy given by Schumann, but suspect some of it should be referred elsewhere. Our description is based on Miller's original of *Cactus recurvus* for the stem and spines and on Pfeiffer's original description of *Echinocactus spiralis* for the flower and fruit. Schumann's description is somewhat different.

Echinocactus spiralis stellaris Salm-Dyck (Cact. Hort. Dyck. 1844. 21. 1845), *Echinocactus stellaris* Karwinsky, also mentioned here by Salm-Dyck as a synonym and by Hemsley (Biol. Centr. Amer. Bot. 1: 538. 1880) as a synonym of *Echinocactus spiralis*, and *Melocactus besleri affinis* (Förster, Handb. Cact. 320. 1846) doubtless are to be referred here.

Echinocactus multangularis Voigt we do not know. It is cited by Schumann (Gesamtb. Kakteen 348) as a synonym of *Echinocactus recurvus*, but no place of publication is given. In the only list of Voigt which we have consulted (Hort. Suburb. Calcutt. 1845) he lists three species of this genus, viz. *ottonis*, *eyriesii*, and *cornigerus*. These are followed by *Cereus multangularis* which suggests that a mistake has been made. Dr. John Hendley Barnhart suggests a different origin for the name of *Echinocactus multangularis*. It is to be noted that Förster's Handbuch appeared the next year after the appearance of Voigt's Calcutta List. Dr. Barnhart's note is as follows:

"I do not think that you have the correct explanation of the name *Echinocactus multangularis* Voigt. Schumann's citation of this name as a synonym of *E. recurvus* appears to me to have been copied from the first edition of Förster's Handbuch (1846), page 316, where under *E. recurvus* you will find the synonym '*C.*' (*i. e.*, '*Cactus*') '*multangularis* Voigt.' In other words Schumann has simply made the slip of writing '*Echinocactus*' instead of '*Cactus*' for the Voigt name. The name '*Cactus multangularis* Voigt' seems to go back in literature as one of the synonyms of this species

(and as a synonym only) to Steud. Nom. Bot. Phan. 132. 1821, where it appears as a synonym of *Cactus nobilis*. I doubt if the name was ever *published* anywhere, but do not think that at any time in its history it had anything to do with *Cereus multangularis*."

Echinocactus glaucus Karwinsky (Pfeiffer, Enum. Cact. 57. 1837), although never described, was referred to this species as a synonym. Dr. Rose examined the type of *Echinocactus spiralis* in Munich in 1912 and believes that it belongs here; *Echinocactus agglomeratus* (Pfeiffer, Enum. Cact. 60. 1837) was referred as a synonym of *Echinocactus spiralis*.

The following varieties seem to be only color or spine forms: *Echinocactus recurvus latispinus*, *E. recurvus solenacanthus*, and *E. recurvus tricuspidatus* (Förster, Handb. Cact. 317. 1846) and *E. recurvus bicolor* (Monatsschr. Kakteenk. **20**: 144. 1910).

Illustrations: Schelle, Handb. Kakteenk. 162. f. 91; Monatsschr. Kakteenk. **16**: 73; **21**: 149; Möllers Deutsche Gärt. Zeit. **29**: 440. f. 16; Abh. Bayer. Akad. Wiss. München **2**: (see 738) pl. 1, sec. 7, f. 4; Knippel, Kakteen pl. 10; R. Grässner, Haupt-Verz. Kakteen **1912**: 13, as *Echinocactus recurvus;* Verh. Ver. Beförd. Gartenb. **3**: pl. 20, as *Melocactus recurvus;* Rev. Hort. **61**: f. 140; Nov. Act. Nat. Cur. **19**: pl. 16, f. 4, 7, as *Echinocactus spiralis*.

Figure 150 is copied from the last illustration above cited.

26. Ferocactus latispinus (Haworth).

Cactus latispinus Haworth, Phil. Mag. **63**: 41. 1824.
Echinocactus cornigerus P. De Candolle, Mém. Mus. Hist. Nat. Paris **17**: 36. 1828.
Mammillaria latispina Tate in Loudon, Gard. Mag. **16**: 26. 1840.
Echinofossulocactus cornigerus Lawrence in Loudon, Gard. Mag. **17**: 318. 1841.
Echinofossulocactus cornigerus elatior Lawrence in Loudon, Gard. Mag. **17**: 318. 1841.
Echinofossulocactus cornigerus rubrospinus Lawrence in Loudon, Gard. Mag. **17**: 318. 1841.
Echinofossulocactus cornigerus angustispinus Lawrence in Loudon, Gard. Mag. **17**: 318. 1841.
Echinocactus latispinus Hemsley, Biol. Centr. Amer. Bot. **1**: 533. 1880.
Echinocactus latispinus flavispinus Weber, Dict. Hort. Bois 467. 1896.

Plant simple, globular or somewhat depressed, 2.5 to 4 dm. high, 4 dm. in diameter; ribs 15 to 23, but usually 21, prominent; areoles large; radial spines 6 to 10, slender, annulate, white to rose, 2 to 2.5 cm. long; central spines 4 or more, stouter and more highly colored than the radials, all straight except one, this much flattened and hooked; flowers campanulate, 2.5 to 3.5 cm. long, rose to purple; perianth-segments narrowly oblong, acute; scales on the ovary closely imbricated, thin and papery, ovate, with thin ciliate margins; scales on flower-tube similar to those on ovary but more elongated; fruit elongated, 4 cm. long (dehiscence not known); seeds described as reniform, slightly pitted, 1.5 mm. long.

Type locality: Mexico.

Distribution: Widely distributed in Mexico; reported from Guatemala by De Candolle.

A plant sent to the New York Botanical Garden by A. de Lautreppe from Mexico in 1905 flowered in November 1913, the same flower opening successively for four days.

Echinocactus cornigerus var. *flavispinus* and var. *latispinus* (Förster, Handb. Cact. 318. 1846), published as synonyms, belong here.

Melocactus latispinus (Pfeiffer, Enum. Cact. 56. 1837) is also to be referred here. *Echinocactus cornigerus* Mociño and Sessé (De Candolle, Prodr. 3: 461. 1828) occurs as a synonym of this plant.

Echinocactus corniger rubrispinosus (Monatsschr. Kakteenk. **12**: 59. 1902) is probably a form of this species.

Illustrations: Abh. Bayer. Akad. Wiss. München **2**: pl. 3, f. 2; Schumann, Gesamtb. Kakteen f. 4, 62; Mém. Mus. Hist. Nat. Paris **17**: pl. 7; De Candolle, Mém. Cact. pl. 10; Cact. Journ. **1**: 54; **2**: 173; Schelle, Handb. Kakteenk. 164. f. 94; Ann. Rep. Smiths. Inst. **1908**: pl. 13, f. 6; Förster, Handb. Cact. ed. 2. 507. f. 60; Dict. Gard. Nicholson 4: 538. f. 19; Suppl. 334. f. 354; Rümpler, Sukkulenten 184. f. 102; Watson, Cact. Cult. 96. f. 31, as *Echinocactus cornigerus;* Cact. Journ. **1**: pl. for March; Monatsschr. Kakteenk. **21**: 11, as *E. corniger flavispinus*.

Plate XIII, figure 2, is from a photograph taken by Dr. MacDougal at El Riego, Tehuacán, Mexico, in 1906; plate XVI, figure 3, shows the flowering top of the plant sent by M. de Lautreppe, above alluded to.

27. Ferocactus crassihamatus (Weber).

Echinocactus crassihamatus Weber, Dict. Hort. Bois 468. 1896.
Echinocactus mathssonii Berge, Monatsschr. Kakteenk. 7: 76. 1897.

Simple, globose to short-cylindric, pale green, somewhat glaucous; ribs 13, rather prominent, obtuse, strongly undulate; areoles large, only a few on each rib; radial spines 8, spreading, the upper ones straight, 2 or 3 of the lower ones hooked; central spines 5, longer and stouter than the radials, usually red, the stoutest one porrect and hooked; flowers small, about 2 cm. long, purple; inner perianth-segments linear-oblong, acute.

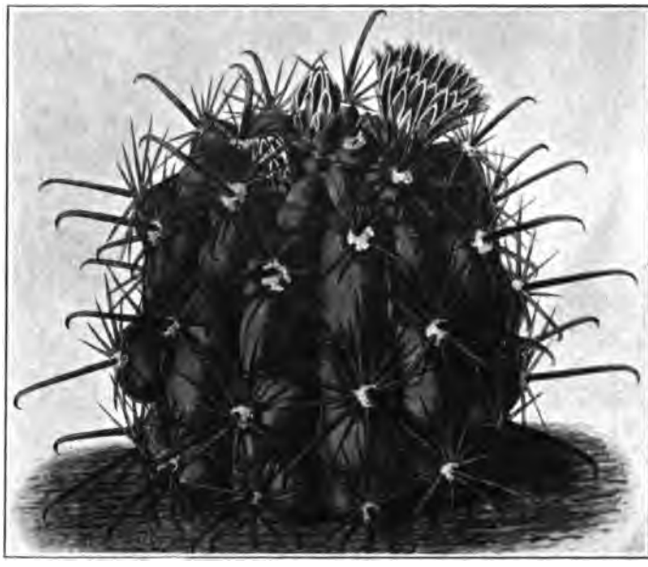


FIG. 151.—Ferocactus crassihamatus.

FIG. 152.—Ferocactus hamatacanthus.

Type locality: Querétaro.
Distribution: Querétaro, Mexico.

We know this plant only from descriptions and illustrations; its size is not recorded.

The original place of publication of *Echinocactus mathssonii*, as given by Schumann (Monatsschr. Kakteenk. 3: 45. 1893), is without description and must be rejected. In the place we cite above there is only a phrase of description, but he later described it in detail.

Illustrations: Blühende Kakteen 1: pl. 8; Schumann, Gesamtb. Kakteen f. 61, as *Echinocactus mathssonii*.

Figure 151 is copied from the first illustration above cited.

28. Ferocactus hamatacanthus (Mühlenpfordt).

*Echinocactus hamatocanthus** Mühlenpfordt, Allg. Gartenz. 14: 371. 1846.
Echinocactus flexispinus Engelmann in Wislizenus, Mem. Tour North. Mex. 111. 1848.
Echinocactus longihamatus Galeotti in Pfeiffer, Abbild. Beschr. Cact. 2: pl. 16. 1848.
Echinocactus sinuatus Dietrich, Allg. Gartenz. 19: 345. 1851.
Echinocactus selispinus sinuatus Poselger, Allg. Gartenz. 21: 119. 1853.
Echinocactus selispinus robustus Poselger, Allg. Gartenz. 21: 119. 1853.
Echinocactus selispinus longihamatus Poselger, Allg. Gartenz. 21: 119. 1853.
Echinocactus longihamatus hamatacanthus Labouret, Monogr. Cact. 201. 1853.
Echinocactus treculianus Labouret, Monogr. Cact. 202. 1853.
Echinocactus longihamatus gracilispinus Engelmann, Proc. Amer. Acad. 3: 273. 1856.

*Originally spelled thus by Mühlenpfordt.

Echinocactus longihamatus crassispinus Engelmann, Proc. Amer. Acad. 3: 273. 1856.
Echinocactus longihamatus brevispinus Engelmann, Proc. Amer. Acad. 3: 274. 1856.
Echinocactus flavispinus Meinshausen, Wochenshr. Gärtn. Pflanz. 1: 28. 1858.
Echinocactus haematochroanthus Hemsley, Biol. Centr. Amer. Bot. 1: 532. 1880.
Echinocactus hamatacanthus longihamatus Coulter, Contr. U. S. Nat. Herb. 3: 365. 1896.
Echinocactus hamatacanthus brevispinus Coulter, Contr. U. S. Nat. Herb. 3: 366. 1896.
Echinocactus longihamatus sinuatus Weber in Schumann, Gesamtb. Kakteen 342. 1898.

Solitary, globular to oblong, up to 60 cm. high; ribs usually 13, sometimes 17, strongly tubercled, 2 to 3 cm. high; areoles large, 1 to 3 cm. apart; radial spines about 12, acicular, terete, 5 to 7 cm. long; central spines 4, elongated, angled, sometimes 15 cm. long, one of them hooked at apex; flowers large, 7 to 8 cm. long, yellow, in some forms said to be scarlet within; fruit oblong, 2 to 5 cm. long, fleshy, edible, dark brown to drab-colored (not red); seeds pitted.

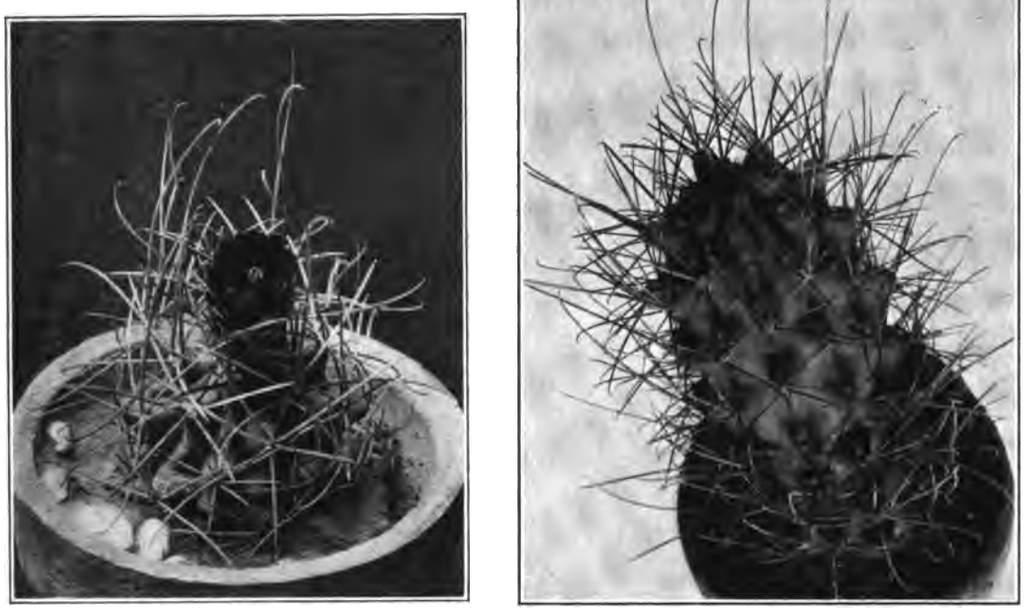
Type locality: Mexico.

Distribution: Southern Texas, New Mexico, and northern Mexico.

This species develops elongated glands, 2 to 4 mm. long, in the areoles between the flower and the spines, as do some of the others; these at first are soft, but in age become hard and spine-like. The fruit of this species is unlike that of most other species of the genus; the skin is thin and the flesh juicy and edible.

Echinocactus insignis Haage jr. (Monatsschr. Kakteenk. 5: 76. 1905), a name only, was referred by Schumann as a synonym of *E. longihamatus*.

The following names (not described) are usually referred to this species or one of



FIGS. 153 and 153*a*.—Ferocactus uncinatus.

its synonyms: *Echinocactus longihamatus sinuatus* Weber (Monatsschr. Kakteenk. 12: 69. 1902), *Echinocactus longihamatus bicolor* (Monatsschr. Kakteenk. 3: 140. 1893), *E. longihamatus deflexispinus* (Monatsschr. Kakteenk. 12: 69. 1902), *E. longihamatus insignis* (Monatsschr. Kakteenk. 12: 69. 1902), and *E. texensis treculianus* (Förster, Handb. Cact. ed. 2. 504. 1885).

Echinocactus deflexispinus Gruson (Schumann, Gesamtb. Kakteen 343. 1898) was never described; it was considered by Schumann to be only a form of this species.

Illustrations: Blanc, Cacti 47. No. 556; Pfeiffer, Abbild. Beschr. Cact. 2: pl. 16; Schelle, Handb. Kakteenk. 159. f. 88; Ann. Rep. Smiths. Inst. 1908: pl. 9, f. 4; Förster,

Handb. Cact. ed. 2. 513. f. 63; Curtis's Bot. Mag. 78: pl. 4632; Blühende Kakteen 1: pl. 9; Schumann, Gesamtb. Kakteen f. 3, 60; Cact. Mex. Bound. pl. 21 to 24; Watson, Cact. Cult. 109. f. 39, as *Echinocactus longihamatus;* Monatsschr. Kakteenk. 16: 57, as *Echinocactus longihamatus sinuatus;* Cact. Mex. Bound. pl. 74, f. 11 to 14, as *Echinocactus sinuatus.*

Plate XVI, figure 1, shows the flowering top of a plant sent by Dr. Rose from near Devil's River, Texas, in 1913, which flowered at the New York Botanical Garden in 1916. Figure 152 is from a photograph of a plant sent by Dr. Edward Palmer from Victoria, Tamaulipas, Mexico, in 1907.

29. Ferocactus uncinatus (Galeotti).

Echinocactus uncinatus Galeotti in Pfeiffer, Abbild. Beschr. Cact. 2: pl. 18. 1848.
Echinocactus ancylacanthus Monville in Labouret, Monogr. Cact. 201. 1853.
Echinocactus uncinatus wrightii Engelmann, Proc. Amer. Acad. 3: 272. 1856.
Echinocactus wrightii Coulter, Cycl. Amer. Hort. Bailey 2: 513. 1900.

Plant short-cylindric, 10 to 20 cm. high, bluish, slightly glaucous, with spindle-shaped roots; ribs usually 13, straight, strongly tubercled, undulate; flowering areoles narrow, extending from the spine-clusters to the base of the tubercles with the flower at the opposite end, felted; areoles also bearing one or more large flat yellow glands, these surrounded by a ring of short yellow hairs; central spine usually solitary, 12 cm. long or less, erect, yellow below, reddish above, hooked at tip; 3 lower radial spines spreading or reflexed, hooked; upper radials straight; flowers brownish, 2 to 2.5 cm. long, widely spreading; perianth-segments numerous, linear-oblong; filaments numerous, short; scales on ovary and flower-tube triangular, scarious-margined, in age broadly auriculate at base; fruit small, oblong, 2 cm. long, at first green, turning brown to crimson and finally scarlet, naked except the appressed scales, somewhat fleshy, edible; seeds black, small, oblong, 1 to 1.5 mm. long, with basal hilum; cotyledons foliaceous.

Type locality: Mexico.

Distribution: Rocky ridges and foothill-slopes in western Texas to central Mexico.

This species is doubtfully included in *Ferocactus*, for it is not closely related to any of those described above. Technically it is different from all the other species in having the tubercles grooved on the upper side and the flower borne at the opposite end of the groove from the spine-cluster. It might be better to segregate it as a generic type.

The glands in the areole described above secrete small drops of a honey-like substance much sought after by bees. While usually found in the groove above the spines and below the flower they are also found on the outer side of the spine-areoles proper. While these glands are usually sessile, they are sometimes elongated and suggest stunted spines. One which we have preserved is 8 mm. long. This species in its short groove above the spine-areole with its sessile gland suggests a relationship with some of the *Coryphanthanae.*

Illustrations: Dict. Gard. Nicholson Suppl. 336. f. 361 (with flowers of an *Echinocereus!);* Pfeiffer, Abbild. Beschr. Cact. 2: pl. 18; Cact. Mex. Bound. pl. 74, f. 9; Watson, Cact. Cult. 123. f. 47; ed. 3. f. 29, as *Echinocactus uncinatus;* Cact. Mex. Bound. pl. 74, f. 10; Monatsschr. Kakteenk. 20: 105, as *Echinocactus uncinatus wrightii.*

Figure 153 is from a photograph of a plant collected by F. E. Lloyd on Escondido Creek near Tuna Springs, Texas, in 1910, which flowered in 1911; figure 153*a* shows the same plant photographed in December 1920.

30. Ferocactus rostii sp. nov.

Sometimes growing in clumps of 8 to 10 heads but usually slender-cylindric, up to 3 meters high; ribs 16 to 22, rather low (hardly 1 cm. high), obtuse, somewhat tubercled; areoles large, white-felted, approximate; spine-clusters closely set, the spines interlocking and almost hiding the body of the plant; radial bristles sometimes wanting but when present 2 to 8, white or yellowish; spines about 12, sometimes fewer, 3 or 4 central, those on the lower part of the plant more or less spreading, those at or near the top erect, somewhat flexible, flattened, annulate, pungent, either straight or curved at apex, perhaps never hooked, usually yellow but sometimes reddish on young plants but also turning yellow in age; flowers dark yellow; fruit red.

M. E. Eaton del.

1. Top of flowering plant of *Ferocactus hamatacanthus*.
2. Flowering plant of *Sclerocactus whipplei*.
3. Top of flowering plant of *Ferocactus latispinus*.

(All natural size.)

A.Hoen & Co

According to Mr. E. C. Rost, for whom the plant is named, this species extends from the western fringe of the Imperial Valley, California, almost to Jacumba and down Lower California for about 40 miles.

Mr. Rost's note on a plant sent to the New York Botanical Garden is as follows:

"This cluster of yellow-spined plants shows in the main plant the appearance of being wrapped in straw. All of the mature plants of this variety have the same peculiarity. Note that the young offshoots of this specimen show a number of bright red spines, which disappear in the mature plants. One specimen I found to be 8 feet in height as shown in photograph. Some of the plants are single, but many are clustered."

FIG. 153*b*.—Ferocactus rostii.

This is a very striking plant, perhaps nearest *F. acanthodes*, but with a much more slender stem, and more appressed spines and these straw-colored.

The type is based on a plant collected in Lower California, 40 miles south of the International Boundary Line (Rost, No. 327).

Figure 153*b* is from a photograph taken by E. C. Rost at the type locality in 1921.

DESCRIBED SPECIES, PERHAPS OF THIS GENUS.

ECHINOCACTUS HAEMATACANTHUS Monville in Weber, Dict. Hort. Bois 466. 1896.

Echinocactus electracanthus haematacanthus Salm-Dyck, Cact. Hort. Dyck. 1849. 150. 1850.

Simple, sometimes perhaps proliferous, short-cylindric, 5 dm. high, 3 dm. in diameter; ribs 12 to 20, stout, light green; spines all straight, reddish with yellowish tips, the radials 6, the centrals 4, 3 to 6 cm. long; flowers funnelform, 6 cm. long, purple; scales of the ovary round, white-margined; fruit ovoid, 3 cm. long.

Type locality: Not cited.

Distribution: Between Puebla and Tehuacán, according to Weber.

We do not know this species and our description is based on Weber's. His differs from the original where the central spine is described as solitary and reflexed. Schumann does not seem to have understood this species, as he first placed it after *E. pilosus*. *Echinocactus gerardii* Weber (Dict. Hort. Bois 466. 1896) is referred here by Schumann but it seems never to have been described.

ECHINOCACTUS RAFAELENSIS Purpus, Monatsschr. Kakteenk. **22**: 163. 1912.

In clusters of 8 to 10, globose to short-cylindric, light green, at the apex slightly depressed and woolly; ribs 13 to 20, prominent; areoles elliptic; radial spines 7 to 9, 3 cm. long, the upper ones somewhat connivent; central spine solitary, 4 to 6 cm. long; flowers and fruit unknown.

Type locality: Minas de San Rafaél, San Luis Potosí, Mexico.

Distribution: Known only from the type locality.

We do not know this species and place it here on the statement of Quehl, who writes that it is similar to *E. robustus* and *E. flavovirens*.

Illustration: Monatsschr. Kakteenk. **23**: 35, as *Echinocactus rafaelensis*.

17. ECHINOMASTUS gen. nov.

Plants small, globular or short-cylindric, ribbed, the ribs low, more or less spiraled, divided into definite tubercles; areoles bearing several acicular spines with or without stouter central ones; flowers central, medium-sized, borne at the spine-areoles, usually purple; fruit small, short-oblong, scaly, becoming dry, dehiscing by a basal opening; scales few, their axils naked; seed large, muricate, black, with a depressed ventral hilum.

Type species: *Echinocactus erectocentrus* Coulter.

The species which we have referred to this genus resemble in size, form, and habit the species of *Coryphantha* much more than they do the species of *Echinocactus* or *Ferocactus*. This resemblance is strengthened by definite tubercles on the ribs. Schumann referred them all to *Thelocactus*, his very complex subgenus of *Echinocactus*.

The generic name is from ἐχῖνος hedgehog, and μαστός breast, referring to the spiny tubercles of the plant. We recognize 6 species, all from northern Mexico and the adjacent parts of the United States. They are closely interrelated.

KEY TO SPECIES.

Areoles elongated, with more or less pectinate spines.
  One or two of the central spines different from the others.
    One central spine elongated, erect ..... 1. *E. erectocentrus*
    One central spine short, conic ..... 2. *E. intertextus*
  Central spines several, nearly alike ..... 3. *E. dasyacanthus*
Areoles circular.
  Central spines subulate, some strongly recurved ..... 4. *E. unguispinus*
  Central spines acicular.
    Globular; ribs 20 to 25; radial spines white ..... 5. *E. macdowellii*
    Ovoid; ribs 18 to 21; radial spines with black tips ..... 6. *E. durangensis*

1. Echinomastus erectocentrus (Coulter).

Echinocactus erectocentrus Coulter, Contr. U. S. Nat. Herb. 3: 376. 1896.

Plants broadly ovoid to short-cylindric, 8 to 14 cm. high, sometimes 10 cm. broad, pale bluish green; ribs 21, somewhat oblique, very low, made up of closely set tubercles; radial spines 14, straight, terete, pale below, red above (in old dead plants dense and interwoven above but pectinate-appressed on lower part of plant); central spines 1 or 2, elongated, erect, slightly swollen at base, more conspicuous in dead than in living plants, usually ascending, one sometimes very short and porrect; flowers pinkish, 3 to 5 cm. long; stamens short, greenish yellow; style longer than the stamens, pale green; stigma-lobes 8, pinkish to deep red; ovary bearing a few ovate scarious scales. (This description is from living plants and differs somewhat from Dr. Coulter's which was made from dead ones.)

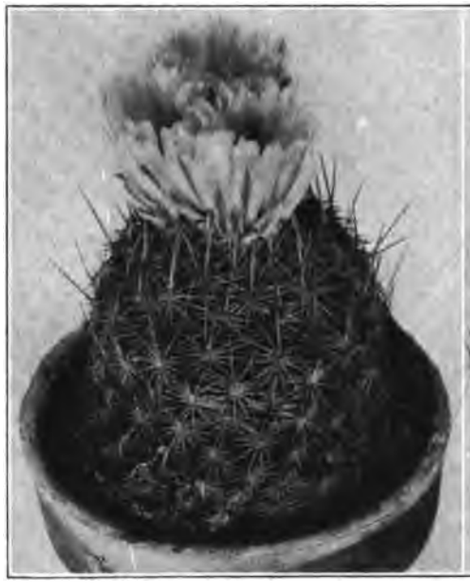


FIG. 154.—Echinomastus erectocentrus.

FIG. 155.—Echinomastus unguispinus.

Type locality: Near Benson, Arizona.

Distribution: Southeastern Arizona.

Unfortunately, Dr. Coulter associated with this species a plant from Saltillo, Mexico, collected by Weber; this plant has been published as *Echinocactus beguinii* Weber, to which

Dr. Schumann erroneously referred *Echinocactus erectocentrus*. *E. beguinii* is described as having a naked ovary and is a quite different plant of the *Coryphanthanae*.

The flowers on various plants differ somewhat in color, the deeper colored flowers being associated with higher colored spines. This difference in color extends also to the stigma-lobes. The flowers give off a delicate odor; they open in the morning and close at night, lasting for four days.

Echinocactus horripilus erectocentrus is credited by Schumann (Gesamtb. Kakteen 443. 1898) to Weber although he never formally published the variety.

Figure 154 is from a photograph of a plant collected by Kirk Bryan in southeastern Arizona in March 1921.

2. Echinomastus intertextus (Engelmann).

Echinocactus intertextus Engelmann, Proc. Amer. Acad. 3: 277. 1856.
Cereus pectinatus centralis Coulter, Contr. U. S. Nat. Herb. 3: 386. 1896.
Echinocereus pectinatus centralis Schumann, Gesamtb. Kakteen 271. 1898.
Echinocereus centralis Rose, Contr. U. S. Nat. Herb. 12: 293. 1909.

Simple, globular or nearly so, 2.5 to 10 cm. in diameter; ribs 13, somewhat acute, more or less divided into tubercles; areoles 5 to 6 mm. apart, somewhat elliptic; spines rigid, red with darker tips; radial spines 16 to 25, appressed, 8 to 15 mm. long, 3 or 4 of the upper radial spines white or nearly so, more slender than the others, almost bristle-like; central spines 4, subulate, 3 of them turned upward and similar to the radials, 10 to 18 mm. long, the other one very short, porrect; flowers 2.5 cm. long, nearly as broad as long, purplish; outer perianth-segments about 20, broadly ovate, white-margined; inner perianth-segments 20 to 25, oblong, mucronate; fruit nearly globular, 8 to 10 mm. in diameter, with a few scarious scales; seeds black, shining, 2 mm. in diameter.

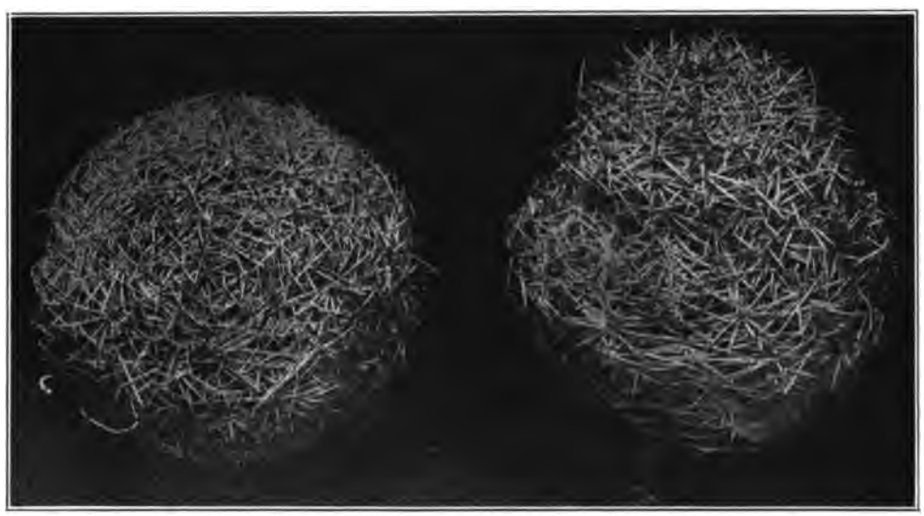


FIG. 156.—Echinomastus intertextus.

Type locality: Not definitely cited.

Distribution: Southwestern Texas, to southeastern Arizona and northern Mexico.

Engelmann states that the scales on the fruit are with or without some wool in their axils. The fruit is always in a mass of wool, but so far as we have seen the scales are always naked in their axils.

When Engelmann described this species he also briefly characterized a variety *dasyacanthus* which we have treated here as a distinct species. He says that *Echinocactus intertextus* in this broad sense ranges from El Paso to the Limpio and southward to Chihuahua and adds that the variety is more common about El Paso. We have seen only

Echinomastus dasyacanthus about El Paso while we have the true *Echinomastus intertextus* from Chihuahua. This latter station may be the type locality for this species.

In making this study we have at last been able to place definitely *Cereus pectinatus centralis* from near Fort Huachuca, Arizona. This *Echinocereus*-like plant was described from two sterile specimens whose flowers and fruit were not known. In 1921 J. W. Gidley sent a single specimen from southeastern Arizona. This flowered a few months afterwards, showing clearly that it was not an *Echinocereus*, but that it belonged to *Echinomastus*. Further study shows that it is referable to *Echinomastus intertextus*, although coming from west of the hitherto known range of the species.

Echinocactus krausei Hildmann (Schumann, Gesamtb. Kakteen 446. 1898) which came from Dragoon Summit, eastern Arizona, may belong here, but Schumann states that the ovary bears spines; it is known to us only from his description.

Illustrations: Schelle, Handb. Kakteenk. 201. f. 133, as *Echinocactus krausei;* Förster, Handb. Cact. ed. 2. 561. f. 72; Cact. Mex. Bound. pl. 34; Blanc, Cacti 46. f. 524, as *Echinocactus intertextus*.

Figure 156 is from a photograph of the type specimen of *Cereus pectinatus centralis*.

3. Echinomastus dasyacanthus (Engelmann).

Echinocactus intertextus dasyacanthus Engelmann, Proc. Amer. Acad. 3: 277. 1856.

Plants cylindric, 10 to 15 cm. high; ribs somewhat spiraled, made up of numerous compressed tubercles; spines slender, more or less purplish; radials 19 to 25, 12 to 22 mm. long; centrals about 4, nearly equal; top of flowering plant and young areoles very woolly; scales and outer perianth-segments red with white margins; inner perianth-segments white or purplish, about 2.5 cm. long, acute or acuminate; ovary bearing a few ovate scales, these naked in their axils; stigma-lobes 9, erect, truncate at apex, deep purple.

Type locality: Near El Paso, Texas.

Distribution: Southwestern Texas.

Most writers, including Engelmann, have treated this species as a variety of *Echinocactus intertextus* but in the light of a fuller series of specimens we believe it deserves specific rank. In the past many plants which we now know are true *Echinomastus dasyacanthus* have been passing as *Echinocactus intertextus*.

Besides the difference brought out by Engelmann this species has much larger flowers than *Echinomastus intertextus* and the inner perianth-segments are acute or acuminate. This species has also a more northern and eastern range.

Coulter (Contr. U. S. Nat. Herb. 3: 375. 1896) refers to *Echinocactus intertextus dasyacanthus*, a plant from San Luis Potosí, which we have not seen but which we suspect belongs elsewhere.

Illustrations: Cact. Mex. Bound. pl. 35, f. 1 to 5, as *Echinocactus intertextus dasyacanthus*.

Figure 157 is from a photograph of a plant sent by F. C. Platt from El Paso, Texas, in 1908.

4. Echinomastus unguispinus (Engelmann).

Echinocactus unguispinus Engelmann in Wislizenus, Mem. Tour North. Mex. 111. 1848.
*Echinocactus trollietii** Rebut, Balt. Cact. Journ. 2: 147. 1895.

Plants simple, usually globular, sometimes short-cylindric, 10 to 12 cm. high when mature, pale bluish green; ribs low; areoles woolly when young, circular; armament very peculiar, at times almost hiding the plant itself, most of the spines being erect or connivent; radial spines widely spreading, often as many as 25, usually white, except the tips, these darker, the upper ones 2 cm. long, a little longer than the lower; central spines 4 to 8, stouter than the radials, at first reddish or black, but becoming grayish blue in age, the lowermost turned outward and downward and all more or less curved; flowers 2.5 cm. long, reddish.

*The usual reference to the first publication of this name is the Monatsschrift für Kakteenkunde (5: 184. 1895). This appeared, however, in December while the Baltimore Cactus Journal reference appeared in July of the same year.

Type locality: About Pelayo, Chihuahua, between Chihuahua City and Parras.
Distribution: States of Chihuahua and Zacatecas, Mexico.

This species was described by Dr. Engelmann in 1848 from a single specimen collected by Dr. Wislizenus in Pelayo, Chihuahua. No other material was known to Dr. Coulter in 1896 when he wrote his monograph and the species was not in cultivation in this country in 1900. In 1908 Professor F. E. Lloyd sent material from the state of Zacatecas, and since then both Dr. Elswood Chaffey and Dr. C. A. Purpus have sent living plants from central Mexico.

Illustrations: Cact. Mex. Bound. pl. 35, f. 6 to 8; Schumann, Gesamtb. Kakteen f. 61, C; Monatsschr. Kakteenk. 5: 185; Knippel, Kakteen pl. 12, f. 1, as *Echinocactus unguispinus;* Balt. Cact. Journ. 2: 147; Orcutt, Rev. Cact. 54, as *Echinocactus trollietii;* West Amer. Sci. 8: 119, as *Echinocactus* No. 79.

Figure 155 is from a photograph of a specimen sent in by Dr. C. A. Purpus from Cerro de Movano, Mexico, which has more slender and less curved central spines than the type.

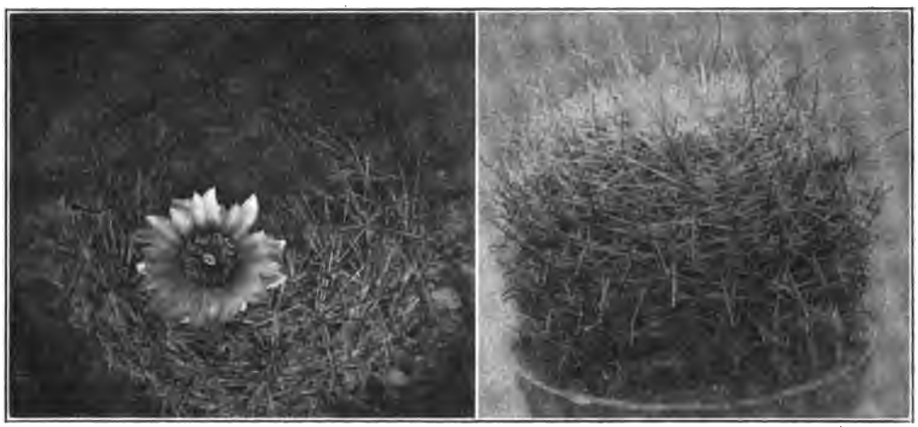


FIG. 157.—Echinomastus dasyacanthus. FIG. 158.—Echinomastus macdowellii.

5. Echinomastus macdowellii* (Rebut).

Echinocactus macdowellii Rebut in Quehl, Monatsschr. Kakteenk. 4: 133. 1894.

Simple, globular or a little depressed, about 7 cm. high, 12 cm. in diameter, covered with a mass of interlocking spines; ribs 20 to 25, pale green, 5 to 7 mm. high, divided into tubercles; radial spines 15 to 20, white, spreading, up to 1.8 cm. long; central spines 3 or 4, dark colored, the longest up to 5 cm. in length; flowers rose-colored, up to 4 cm. long; ovary globose, said to be scaly.

Type locality: Not cited.
Distribution: Northern Mexico.

We have had this species in cultivation, but it has never flowered in this country. According to Mr. McDowell, it comes from Nuevo Leon near the border of Coahuila, Mexico.

In addition to the synonyn cited above the Index Kewensis cites a homonym, credited to C. R. Orcutt (West Amer. Sci. 8: 118. 1894). Perhaps both names refer to the same plant since they appeared in the same year, the first in September and the second in November.

Illustrations: Knippel, Kakteen pl. 9; Cact. Journ. 1: pl. for March; Monatsschr. Kakteenk. 4: 134; West Amer. Sci. 8: 118; Schelle, Handb. Kakteenk. 199. f. 131; Orcutt, Rev. Cact. 54, as *Echinocactus macdowellii.*

Figure 158 is from a photograph obtained by Dr. Rose from L. Quehl in 1912.

*The original spelling of the specific name was *E. mcdowellii,* but Schumann has corrected it to *E. macdowellii.*

6. Echinomastus durangensis (Rünge).

Echinocactus durangensis Rünge, Hamb. Gartenz. 46: 231. 1890.

Simple, ovoid, about 8 cm. long, 7 cm. in diameter; ribs 18 to 21, low; areoles white-woolly when young, but without wool when old; radial spines 15 to 30, the lower ones shorter than the upper, more or less incurved, white except the black tips, 1.5 cm. long; central spines 3 or 4, a little longer than the radials, acicular, about 2 cm. long; flowers and fruit not known.

Type locality: Not cited, but Schumann reports it only from Rio Nazas, west of Villa Lerdo, Durango, Mexico.

Distribution: Zacatecas and Durango, Mexico.

This species is similar to *Echinomastus unguispinus*, but not so large, with more slender and lighter-colored spines, none of them strongly recurved. We know it only from a specimen collected in Zacatecas by Dr. Elswood Chaffey in 1910.

Illustration: Schumann, Gesamtb. Kakteen f. 61, B, as *Echinocactus durangensis*.

18. GYMNOCALYCIUM Pfeiffer, Abbild. Beschr. Cact. 2: under pl. 1 and pl. 12. 1845.*

Plants globular, simple or cespitose, strongly ribbed; ribs divided into tubercles often protruding at the base; flowers campanulate to short-funnelform, from upper and normally from the nascent areoles, usually large for size of plant, white, pink, or rarely yellow; flower-tube bearing broad scales, these with naked axils; fruit oblong, red so far as known, scaly; seeds cap-shaped or dome-shaped, brownish, tuberculate.

The species of this genus which were treated by Schumann are found in his subgenus *Hybocactus* of *Echinocactus*. We recognize about 23 species, all from South America, east of the Andes and chiefly from Argentina, with a few species from Bolivia, Paraguay, and Uruguay. The generic name is from γυμνός naked, and κάλυξ bud, referring to the glabrous flower-bud.

The genus was originally based on three species of which *G. denudatum* was the first, and this is taken by us as the generic type. Heynhold (Nom. 2: 103. 1846) uses the three names of Pfeiffer.

The tubercles on the ribs have an enlargement more or less conspicuous just below the spine-areole which Schumann calls a "chin." So far as our observation goes this is present in all the species, although it is very small in *G. saglione*, and it may be of considerable diagnostic importance. By this character plants belonging to species of *Gymnocalycium* can be referred generically when not in flower.

The flower in this genus, as in the other genera of this tribe, normally comes from the center of the plant, borne on nascent areoles; but sometimes, especially in greenhouse plants, the flowers of some are lateral and borne on old areoles as in *E. gibbosus* (see Blühende Kakteen 1: pl. 55), *E. stellatus*, and *E. schickendantzii* (see Schumann, Gesamtb. Kakteen Nachtr. f. 29).

KEY TO SPECIES.

A. Inner perianth-segments yellow to yellowish green.
  Ribs acute ..... 1. *G. mihanovichii*
  Ribs rounded.
    Ribs 11 to 14; inner perianth-segments broadly oblong.
      Ribs very definite; tubercles broader than high ..... 2. *G. netrelianum*
      Ribs low, rather indefinite; tubercles subglobose ..... 3. *G. leeanum*
    Ribs 9; inner perianth-segments narrowly oblong ..... 4. *G. guerkeanum*
AA. Inner perianth-segments red, pink, or white.
  B. Ribs hardly tubercled.
    Ovary and tube bearing few scales.
      Scales on ovary rounded ..... 5. *G. spegazzinii*
      Scales on ovary acute ..... 6. *G. denudatum*
    Ovary and tube very scaly ..... 7. *G. hyptiacanthum*

* Pfeiffer says: "Pfeiff. in Catal. Hort. Schelh. 1843" but this we do not credit as place of publication.

KEY TO SPECIES—continued.

BB. Ribs with prominent tubercles.
C. Flowers with a very short tube.
Spines brown to black.
Central spines one or more.
Tubercles without a distinct chin ..... 8. *G. saglione*
Tubercles with a large chin ..... 9. *G. mostii*
Central spines wanting ..... 10. *G. gibbosum*
Spines yellow.
Ribs 10 to 15 ..... 11. *G. multiflorum*
Ribs 22 ..... 12. *G. brachyanthum*
CC. Flowers with more or less elongated tube.
Spines yellow, at least when young, or white.
Spines 5 to 7, tortuous, up to 6 cm. long ..... 13. *G. anisitsii*
Spines a little curved, 1 to 4 cm. long.
Spines 10 to 13.
Spines slender, not appressed ..... 14. *G. monvillei*
Spines stout, appressed ..... 15. *G. melanocarpum*
Spines 3, rarely more ..... 16. *G. uruguayense*
Spines brown.
Central spines present.
Ribs acute ..... 17. *G. megalothelos*
Ribs obtuse ..... 18. *G. kurtzianum*
Central spines none.
Spines slender, acicular.
Plant dark green ..... 19. *G. damsii*
Plant reddish or bronze ..... 20. *G. platense*
Spines stout, subulate.
Flower-tube as long as limb; flowers sublateral ..... 21. *G. schickendantzii*
Flower-tube much shorter than limb; flowers central ..... 22. *G. stuckertii*
AAA. Species not grouped ..... 23. *G. joossensianum*

FIG. 159.—Gymnocalycium mihanovichii.

FIG. 160.—Gymnocalycium netrelianum.

1. Gymnocalycium mihanovichii (Frič and Gürke).

Echinocactus mihanovichii Frič and Gürke, Monatsschr. Kakteenk. 15: 142. 1905.

Plant somewhat depressed, 5 cm. in diameter or less, grayish green; ribs 8, prominent, acute; areoles small, 12 mm. apart; spines 5 or 6, spreading, yellowish; flowers about 3 cm. long; outer perianth-segments brownish green; inner perianth-segments green to yellowish green, sometimes tinged with red; scales on the slender flower-tube and ovary broad.

Type locality: Paraguay.

Distribution: Paraguay.

We have not grown this plant, but Dr. Rose studied it in Berlin, in 1912.

This plant is successfully grown as a graft on the top of some of the *Cereus* allies.

Illustrations: Blühende Kakteen **2**: pl. 101; Monatsschr. Kakteenk. **29**: 67, as *Echinocactus mihanovichii*.

Figure 159 is copied from the first illustration above cited.

2. Gymnocalycium netrelianum (Monville).

Echinocactus netrelianus Monville in Labouret, Monogr. Cact. 248. 1853.

Simple or sometimes proliferous, globular or somewhat depressed, 3 cm. in diameter, naked at apex; ribs 14, broad, rounded, tuberculate, somewhat glaucous; spines 5 to 8, all radial, brownish, setaceous, flexible, less than 1 cm. long; flowers pale citron-yellow, 5 cm. long; inner perianth-segments broadly oblong, acute.

Type locality: Not cited.

Distribution: Probably Uruguay or Argentina, according to Schumann, but not reported from the former by Arechavaleta or from the latter by Spegazzini.

According to Dr. Weber, this species is very similar to *E. hyptiacanthus*, but it is much smaller and the flowers are yellow, not white.

Illustration: Blühende Kakteen **1**: pl. 39, b, as *Echinocactus netrelianus*.

Figure 160 is copied from the illustration above cited.

3. Gymnocalycium leeanum (Hooker).

Echinocactus leeanus Hooker in Curtis's Bot. Mag. **71**: pl. 4184. 1845.

Globose or somewhat depressed, glaucous-green; tubercles hemispherical but usually 6-angled at base, not definitely arranged; areoles oval; spines about 11, slender; radial spines somewhat curved, appressed, 12 mm. long; central spine 1, straight, porrect; flowers large; outer perianth-segments green, tinged with purple; inner perianth-segments pale yellow.

Type locality: Argentina.

Distribution: Argentina and Uruguay.

This plant was originally obtained from Messrs. Lee, of the Hammersmith Nursery, who grew it from seed sent by Mr. John Tweedie from Argentina. Schumann referred it to *Echinocactus hyptiacanthus*, a white-flowered species from which we believe that it must be distinct. We have found no records of the rediscovery of this species, but we are inclined to refer here J. A. Shafer's No. 123, collected at Salto, Uruguay, March 7, 1917. This plant flowered in the New York Botanical Garden in 1918 and has beautiful yellow flowers.

Illustrations: Curtis's Bot. Mag. **71**: pl. 4184; Loudon, Encycl. Pl. ed. 3. 1377. f. 19370, as *Echinocactus leeanus*.

Figure 164 is copied from the first illustration cited above.

4. Gymnocalycium guerkeanum (Heese).

Echinocactus guerkeanus Heese, Monatsschr. Kakteenk. **21**: 132. 1911.

Usually simple but sometimes cespitose, about 5 cm. in diameter; ribs 9, broad and obtuse, somewhat tuberculate; spines all radial, usually 5, unequal, the longest 12 mm. long, yellowish, with brownish bases, rough, usually spreading or appressed; flowers near center of plant, 5 cm. long, yellow, nearly as broad as long when expanded; inner perianth-segments narrowly oblong, acute, sometimes toothed; scales on the ovary acute; fruit and seeds not known.

Type locality: Bolivia.

Distribution: Bolivia.

This species is said to be near *E. netrelianus* but apparently quite distinct. We know it only from description and illustrations.

Illustrations: Monatsschr. Kakteenk. **21**: 133; Blühende Kakteen **3**: pl. 144, as *Echinocactus guerkeanus*.

Figure 161 is copied from the last illustration above cited.

5. Gymnocalycium spegazzinii nom. nov.

Echinocactus loricatus Spegazzini, Anal. Mus. Nac. Buenos Aires III. **4**: 502. 1905. Not Poselger, 1853.

Depressed, globular, 6 cm. high, 14 cm. in diameter, grayish green; ribs 13, broad and low, rounded on the margin; areoles elliptic; spines usually 7, subulate, rigid, appressed to the ribs, sometimes recurved, grayish brown, 2 to 2.5 cm. long; flowers 7 cm. long; inner perianth-segments more or less rose-tinted; filaments and style violaceous; stigma-lobes 16, white to rose-colored; scales on the ovary few, broad.

Type locality: La Viña, province of Salta, Argentina.

Distribution: Known only from the type locality.

As this plant requires a new name it gives us great pleasure to dedicate it to such an enthusiastic cactus student as Dr. Carlos Spegazzini of La Plata, Argentina.

Figure 162 is from a photograph of the type specimen, contributed by Dr. Spegazzini.

FIG. 161.—G. guerkeanum. FIG. 162.—G. spegazzinii.

6. Gymnocalycium denudatum (Link and Otto) Pfeiffer, Abbild. Beschr. Cact. **2**: under pl. 1. 1845.

Echinocactus denudatus Link and Otto, Icon. Pl. Rar. 17. 1828.
Cereus denudatus Pfeiffer, Enum. Cact. 73. 1837.
Echinocactus denudatus typicus Schumann in Martius, Fl. Bras. 4^2: 248. 1890.

Simple, subglobose or somewhat depressed, 5 to 15 cm. in diameter; ribs 5 to 8, very broad and low, obtuse, hardly tubercled; spines usually only 5, sometimes 8, all radial, appressed, slender, sometimes curved; flowers white or pale rose-colored; perianth-segments oblong, acute; ovary and flower-tube bearing only an occasional acute scale.

Type locality: Southern Brazil.

Distribution: Southern part of Brazil and reported from Argentina and Uruguay.

Echinocactus intermedius (Monatsschr. Kakteenk. 8: 36. 1898) is, according to Dr. Schumann, a hybrid between this species and *Echinocactus multiflorus*, while Hildmann (Garten-Zeitung 4: 479. f. 111. 1885) states that it is a cross between this species and *E. monvillei*. Numerous varieties have been described, some belonging here, while others have been referred to other species, and some are doubtless mere forms not deserving of a name. The following we do not know and they are therefore left under this species: var. *octogonus* Schumann (Martius, Fl. Bras. 4^2: 248. 1890), var. *golzianus* Mundt (Monatsschr. Kakteenk. 7: 187. 1897), vars. *wieditzianus*, *andersohnianus*, *heuschkelianus*, *meiklejohnianus*, *delaetianus*, *wagnerianus*, *scheidelianus* (F. Haage jr., Monatsschr. Kakteenk.

8: 36, 37. 1898), var. *roseiflorus* Hildmann (Schumann, Gesamtb. Kakteen 414. 1898), and *bruennowii* and *flavispinus* (Schelle, Handb. Kakteenk. 189. 1907).

Echinocactus denudatus paraguayensis, sometimes credited to Mundt and sometimes to Haage jr., has not been formally published, but has been illustrated as follows: Schelle, Handb. Kakteenk. 190. f. 123; Tribune Hort. 4: pl. 140; Gartenwelt 9: 266; De Laet, Cat. Gen. f. 3. This plant has been referred to by Schumann (Monatsschr. Kakteenk. 13: 50, 51, 109) as *Echinocactus paraguayensis*.

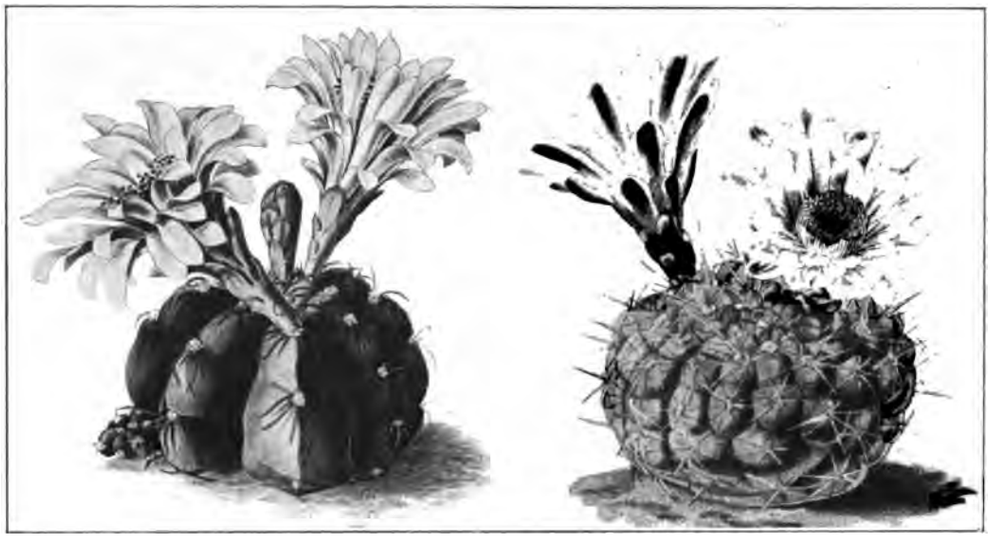


FIG. 163.—Gymnocalycium denudatum.

FIG. 164.—Gymnocalycium leeanum.

Illustrations: Martius, Fl. Bras. 4²: pl. 50, f. 1; Möllers Deutsche Gärt. Zeit. 25: 474. f. 6, No. 3; Blühende Kakteen 1: pl. 59; Schumann, Gesamtb. Kakteen f. 72; Monatsschr Kakteenk. 3: 158. f. I; 14: 41; 29: 141; Link and Otto, Icon. Pl. Rar. pl. 9; Schelle, Handb Kakteenk. 188. f. 119, as *Echinocactus denudatus;* De Laet, Cat. Gen. f. 10; Tribune Hort. 4: pl. 139, as *E. denudatus* var.; Schelle, Handb. Kakteenk. 189. f. 120, as *E. denudatus bruennowii;* Schelle, Handb. Kakteenk. 189. f. 121, as *E. denudatus delaetii;* Schelle, Handb. Kakteenk. 189. f. 122, as *E. denudatus heuschkehlii;* De Laet, Cat. Gen. f. 18, as *Echinocactus denudatus paraguayensis;* Garten-Zeitung 4: 479. f. 111, as *E. denudatus intermedius*.

Figure 163 is copied from the third illustration above cited.

7. Gymnocalycium hyptiacanthum (Lemaire).

Echinocactus hyptiacanthus Lemaire, Cact. Gen. Nov. Sp. 21. 1839.
Cactus hyptiacanthus Lemaire in Steudel, Nom. ed. 2. 1: 246. 1840.
Echinocactus hyptiacanthus eleutheracanthus Monville in Labouret, Monogr. Cact. 249. 1853.
Echinocactus hyptiacanthus megalotelus Monville in Labouret, Monogr. Cact. 249. 1853.
Echinocactus hyptiacanthus nitidus Monville in Labouret, Monogr. Cact. 249. 1853.

Simple, globose or sometimes depressed, 5 to 7 cm. in diameter, dull green, the apex somewhat umbilicate; ribs 9 to 12, broad, obtuse, somewhat tuberculate; radial spines 5 to 9, spreading or appressed, 10 to 12 mm. long, flexible, sometimes pubescent; central spine solitary or wanting; flowers white, 4.5 to 5 cm. long.

Type locality: Not cited.

Distribution: Uruguay.

This plant is sometimes distributed as *Echinocactus multiflorus*, but it is very different from that species. It was first described from barren plants, but afterwards Labouret described the flowers as white as did also Arechavaleta and Gürke. We believe, there-

fore, that the yellow-flowered species (*G. leeanum*), referred here by Schumann, should be excluded.

Illustrations: Schumann, Gesamtb. Kakteen f. 70; Blühende Kakteen 3: pl. 164, as *Echinocactus hyptiacanthus*.

8. Gymnocalycium saglione (Cels).

Echinocactus saglionis Cels, Portef. Hort. 180. 1847.
Echinocactus hybogonus Salm-Dyck, Cact. Hort. Dyck. 1849. 167. 1850.
Echinocactus hybogonus saglionis Labouret, Monogr. Cact. 257. 1853.

Plants simple, globular, often very large, sometimes 3 dm. in diameter, dull green; ribs 13 to 32 according to the size of the plant, low, very broad, sometimes 4 cm. long, separated by wavy intervals, divided into large, low, rounded tubercles; areoles 2 to 4 cm. apart, large, felted when young; spines dark brown to black, at first ascending, afterwards more or less curved outward, 8 to 10 on small plants but on old plants often 15 or more, 3 to 4 cm. long; central spines 1 to several; flowers white or slightly tinged with pink, 3.5 cm. long, the tube short and broadly funnelform; inner perianth-segments spatulate, acute; scales of the ovary nearly orbicular, rounded, with a scarious margin.

FIG. 165.—Gymnocalycium saglione.

FIG. 166.—Gymnocalycium gibbosum.

Type locality: Catamarca, Tucuman, Argentina.

Distribution: Northern Argentina and perhaps southern Bolivia.

Our Bolivian reference is based on a living specimen and flowers collected by P. L. Porte at Lagunillas, southeastern Bolivia, July 1920, and delivered to us in good condition March 10, 1921; this may or may not belong here; it flowered May 7 and again on June 21, 1921. It may be described as follows:

Ribs 8, obtuse; flower 3 to 3.5 cm. long; flower-tube proper very short, only 1 to 2 mm. long; throat of flower broad, funnelform, 15 mm. long, bearing many stamens; inner surface of throat and tube deep reddish purple; filaments short, purple; style and stigma-lobes purple; inner perianth-segments short-oblong, obtuse, ochre-yellow, but drying pinkish.

According to Labouret, *Echinocactus hybogonus* which we refer here as a synonym is a native of Chile, but probably came from Argentina.

Illustrations: De Laet, Cat. Gén. f. 14, 17; Gartenwelt 7: 279; Blühende Kakteen 1: pl. 58; Monatsschr. Kakteenk. 12: 27; Schumann, Gesamtb. Kakteen Nachtr. f. 30; Schelle, Handb. Kakteenk. f. 125, as *Echinocactus saglionis*.

Plate XVII, figure 1, shows a plant brought by Dr. Shafer from near Tapía, Argentina, in 1917 (No. 94), which flowered in the New York Botanical Garden in May 1919. Figure 165 is from a photograph of an Argentine specimen contributed by Dr. Spegazzini.

9. Gymnocalycium mostii (Gürke) Britton and Rose, Addisonia **3**: 5. 1918.

Echinocactus mostii Gürke, Monatsschr. Kakteenk. **16**: 11. 1906.

Plant depressed-globose, 6 to 7 cm. high, 13 cm. in diameter, dark green; ribs 11 to 14, broad and obtuse, more or less tubercled, often strongly; spines subulate, brownish; radial spines 7 to 9, unequal, 6 to 22 mm. long; central spine solitary, 18 to 20 mm. long; flower campanulate, pale red, 6 to 8 cm. broad; perianth-segments spreading, oblong; scales on the ovary 8 to 10, broad.

Type locality: Córdoba, Argentina.

Distribution: Province of Córdoba.

Illustrations: Blühende Kakteen **2**: pl. 93, as *Echinocactus mostii;* Addisonia **3**: pl. 83, B. Plate XVII, figure 2, shows the top of a plant in bloom, brought by Dr. Rose from Cassafousth, Córdoba, Argentina, to the New York Botanical Garden, in 1915; figure 3 shows a flower.

10. Gymnocalycium gibbosum (Haworth) Pfeiffer, Abbild. Beschr. Cact. **2**: under pl. 1. 1845.

Cactus gibbosus Haworth, Syn. Pl. Succ. 173. 1812.
Cactus nobilis Haworth, Syn. Pl. Succ. 174. 1812. Not Linnaeus, 1767.
Cactus reductus Link, Enum. **2**: 21. 1822.
Echinocactus gibbosus De Candolle, Prodr. **3**: 461. 1828.
Cereus reductus De Candolle, Prodr. **3**: 463. 1828.
Echinocactus nobilis Haworth, Phil. Mag. **7**: 115. 1830.
Cereus gibbosus Pfeiffer, Enum. Cact. 74. 1837.
Echinocactus mackieanus Hooker in Curtis's Bot. Mag. **64**: pl. 3561. 1837.
Echinocactus gibbosus nobilis Monville in Lemaire, Cact. Gen. Nov. Sp. 91. 1839.
Gymnocalycium reductum Pfeiffer, Abbild. Beschr. Cact. **2**: pl. 12. 1847.
Echinocactus reductus Schumann, Monatsschr. Kakteenk. **5**: 107. 1895.
Echinocactus gibbosus chubutensis Spegazzini, Anal. Mus. Nac. Buenos Aires II. **4**: 285. 1902.
Echinocactus gibbosus ventanicola Spegazzini, Anal. Mus. Nac. Buenos Aires III. **2**: 7. 1903.
Echinocactus spegazzinii Weber in Spegazzini, Anal. Mus. Nac. Buenos Aires III. **2**: 7. 1903.
Echinocactus gibbosus typicus Spegazzini, Anal. Mus. Nac. Buenos Aires III. **4**: 503. 1905.

Plants simple, sometimes depressed, but usually taller than thick, sometimes 20 cm. high; ribs 12 to 14, broad, strongly tubercled; spines 7 to 12, all radial, straight or somewhat curved, usually light brown; flowers white to pinkish, 6 to 6.5 cm. long; inner perianth-segments oblong; ovary-scales ovate, acutish.

Type locality: Not cited.

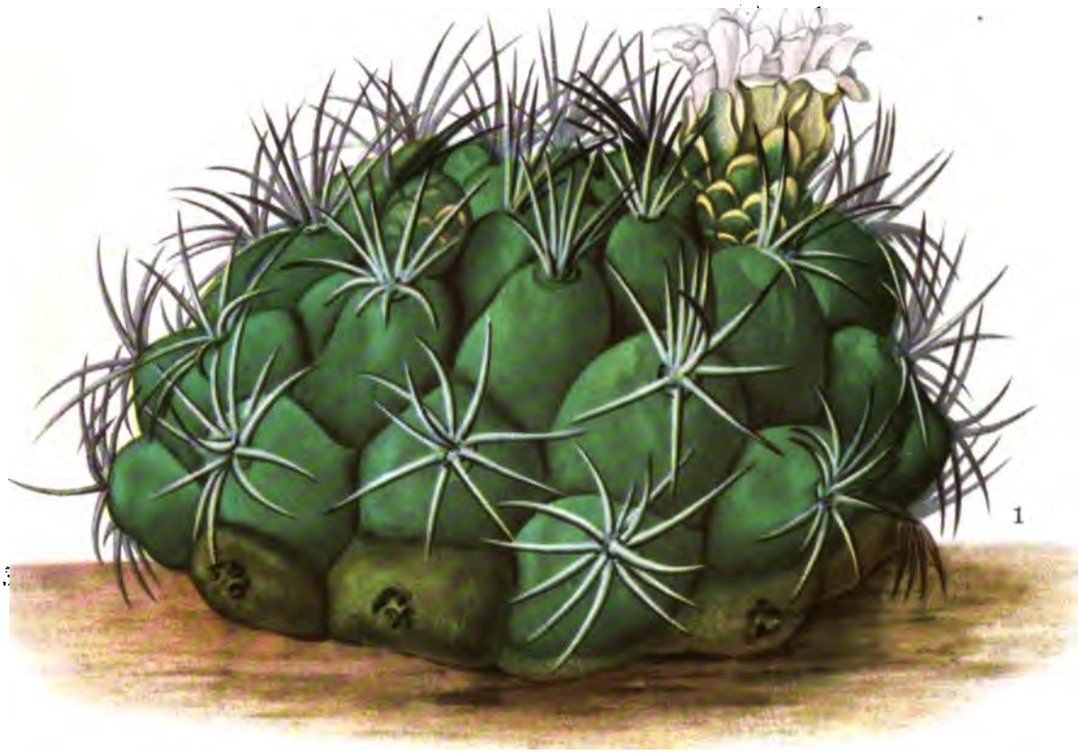
Distribution: Argentina.

Numerous varieties have been described under this species, among which are the following: *celsianus* Labouret (Förster, Handb. Cact. ed. 2. 583. 1885), *cerebriformis* Spegazzini (Anal. Soc. Cient. Argentina **48**: 50. 1899), *fennellii* F. A. Haage jr. (Monatsschr. Kakteenk. **9**: 115. 1899; *Echinocactus fennellii* F. A. Haage jr. in Schumann, Gesamtb. Kakteen 409. 1898), *ferox* Labouret (Förster, Handb. Cact. ed. 2. 583. 1885; *Echinocactus ferox*, Monatsschr. Kakteenk. **4**: 193. 1894), *leonensis* Hildmann (and *Echinocactus leonensis* Cels in Schumann, Gesamtb. Kakteen 409. 1898), *leucacanthus* Rümpler (Förster, Handb. Cact. ed. 2. 583. 1885), *leucodictyus* Salm-Dyck (Cact. Hort. Dyck. 1849. 34. 1850; *Echinocactus leucodictyus* Salm-Dyck, Cact. Hort. Dyck. 1849. 34. 1850), *pluricostatus* (Förster, Handb. Cact. ed. 2. 584. 1885), *polygonus* Schumann (Gesamtb. Kakteen 409. 1898), and *schlumbergeri* Rümpler (Förster, Handb. Cact. ed. 2. 584. 1885; *Echinocactus schlumbergeri* Cels in Schumann, Gesamtb. Kakteen 409. 1898).

Echinocactus towensis Cels (Schumann, Gesamtb. Kakteen 409) which comes from Towa, an island off the coast of Argentina, we do not know. It may be of this relationship.

Schumann (Gesamtb. Kakteen 409. 1898) uses the binomial *Echinocactus celsianus* Labouret, but says it is a variety of this species. *Echinocactus globosus cristatus* is only a gardener's name for a monstrosity. *Echinopsis gibbosa* Pfeiffer (Förster, Handb. Cact. 291. 1846) was given as a synonym of this species.

Illustrations: Blühende Kakteen **1**: pl. 55; Schumann, Gesamtb. Kakteen f. 71; Lemaire, Icon. Cact. pl. 13 (?); Gartenwelt **15**: 536; Möllers Deutsche Gärt. Zeit. **25**: 474. f. 6, No. 28; Monatsschr. Kakteenk. **26**: 21, as *Echinocactus gibbosus;* Edwards's Bot. Reg. **2**:



M. E. Eaton del.

1. Flowering plant of *Gymnocalycium saglione.*
2. Top of flowering plant of *Gymnocalycium mostii.*
3. Flower of same.

(All natural size.)

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pl. 137; Loddiges, Bot. Cab. **16**: pl. 1524; Reichenbach, Fl. Exot. pl. 326, as *Cactus gibbosus;* Pfeiffer, Abbild. Beschr. Cact. **2**: pl. 12, as *Gymnocalycium reductum;* Curtis's Bot. Mag. **64**: pl. 3561, as *Echinocactus mackieanus;* Curtis's Bot. Mag. **75**: pl. 4443, as *Cereus reductus;* Monatsschr. Kakteenk. **30**: 181, as *Echinocactus gibbosus nobilis.*

Figure 166 is from a photograph obtained by Dr. Rose from Dr. Spegazzini in 1915.

11. Gymnocalycium multiflorum (Hooker) Britton and Rose, Addisonia **3**: 5. 1918.

Echinocactus multiflorus Hooker in Curtis's Bot. Mag. **71**: pl. 4181. 1845.

Simple or cespitose, globular or somewhat depressed or sometimes short-columnar, 9 cm. high or more, sometimes 12 cm. in diameter; ribs 10 to 15, broad at base, somewhat tubercled, especially above, acutish; areoles elliptic, 10 mm. long; spines 7 to 10, all radial, spreading, somewhat flattened, stout, yellowish, the longest one 3 cm. long; flower-bud ovoid, covered with imbricate scales; flowers 3.5 to 4 cm. long, pinkish to nearly white, short-campanulate; inner perianth-segments oblong, 3 cm. long, obtuse or acute; scales on the ovary broad and rounded, their margins scarious.

Type locality: Not cited.

Distribution: Reported from Brazil, Uruguay, Paraguay, and Argentina. We know it definitely from Argentina, where it was collected by Dr. Rose in 1915, in Córdoba.

Schumann (Gesamtb. Kakteen 405. 1898) describes briefly the three following varieties: *albispinus*, *parisiensis*, and *hybopleurus*.

Echinocactus ourselianus Monville (Salm-Dyck, Cact. Hort. Dyck. 1849. 34. 1850) is cited by Schumann as a synonym of this species, but it was never published; the name was attributed to Cels by Salm-Dyck. Its variety *albispinus* (Monatsschr. Kakteenk. **5**: 111. 1895) is sometimes met with.

Illustrations: Möllers Deutsche Gärt. Zeit. **25**: 474. f. 6, No. 22; Loudon, Encycl. Pl. ed. 3. 1376. f. 19369; Monatsschr. Kakteenk. **26**: 67; Curtis's Bot. Mag. **71**: pl. 4181; Blühende Kakteen **1**: pl. 30, as *Echinocactus multiflorus;* Addisonia **3**: pl. 83, A.

FIG. 167.—Gymnocalycium multiflorum.

Plate XVIII, figure 3, shows a flowering plant brought by Dr. Rose from Cosquin, Argentina, to the New York Botanical Garden in 1915, where it promptly bloomed. Figure 167 is from a photograph of a plant from Catamarca, Argentina, contributed by Dr. Spegazzini.

12. Gymnocalycium brachyanthum (Gürke).

Echinocactus brachyanthus Gürke, Monatsschr. Kakteenk. **17**: 123. 1907.

Stem simple, depressed-globose, 7 cm. high, 18 cm. in diameter; ribs 22, strongly tubercled; tubercles 5 or 6-sided; areoles elliptic; spines 5 to 7, all radial, subulate, yellowish, 10 to 25 mm. long; flowers, including the ovary, 3 to 5 cm. long, campanulate; inner perianth-segments white to rose-colored; scales of the ovary few, broader than long, rounded, the margin scarious.

Type locality: Argentina.

Distribution: Northern Argentina.

We have studied a plant sent to the New York Botanical Garden from Berlin in 1914 which has not yet flowered.

13. Gymnocalycium anisitsii (Schumann).

Echinocactus anisitsii Schumann, Blühende Kakteen **1**: pl. 4. 1900.

Simple, short-cylindric, about 1 dm. long, pale green; ribs 11, strongly tubercled, acute; spines 5 to 7, yellowish, slender, usually all radial, subulate, somewhat angled, tortuous, sometimes 6 cm. long; flower 4 cm. long, somewhat funnelshaped; scales and outer perianth-segments broad, greenish white; inner perianth-segments white, broadly oblong, acute.

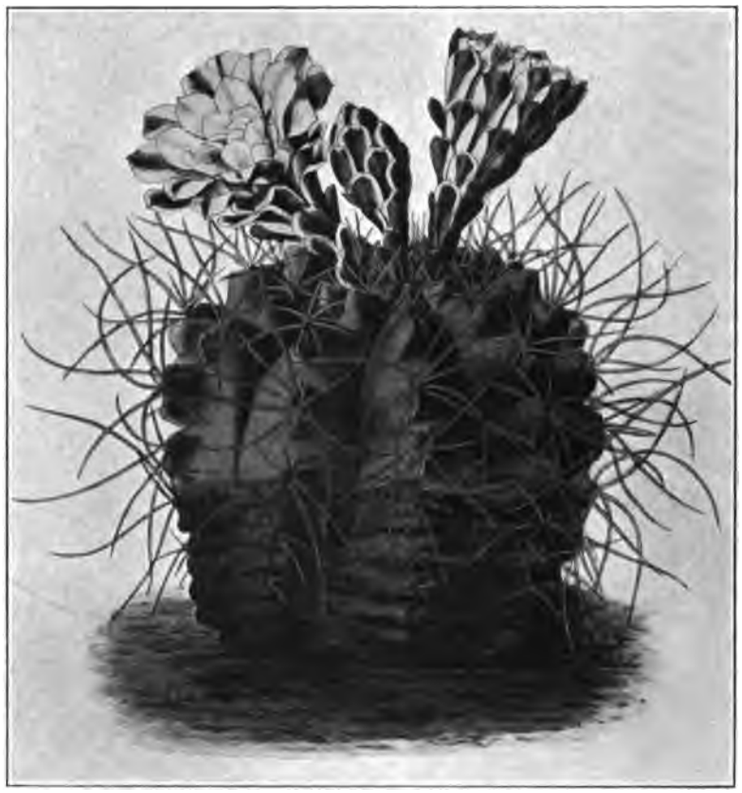

FIG. 168.—Gymnocalycium anisitsii.

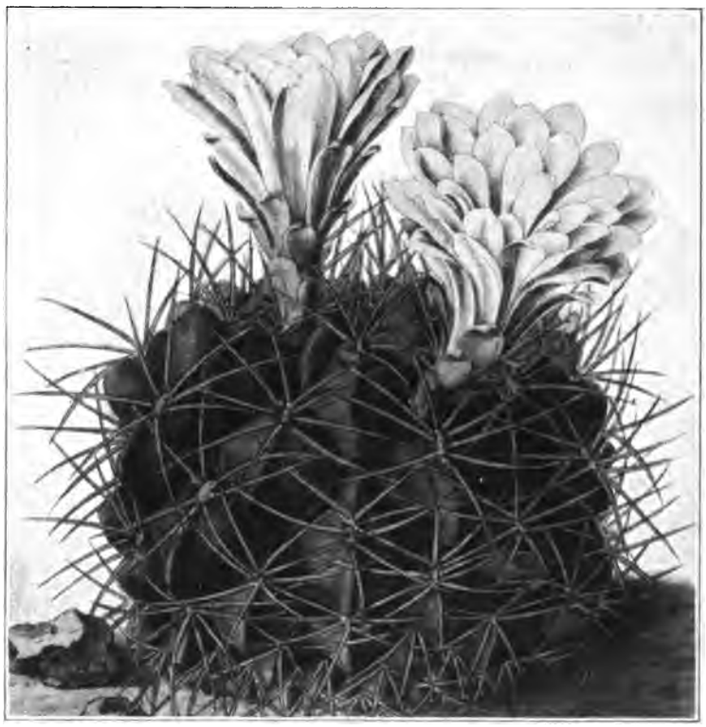

FIG. 169.—Gymnocalycium monvillei.

M. E. Eaton del.

1. Flowering plant of *Gymnocalycium megalothelos*.
2. Top of flowering plant of *Gymnocalycium platense*.
3. Flowering plant of *Gymnocalycium multiflorum*.

(All natural size.)

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Type locality: Rio Tigatigami, Paraguay.

Distribution: Paraguay.

Illustrations: Blühende Kakteen 1: pl. 4; Monatsschr. Kakteenk. 29: 81; Schumann, Gesamtb. Kakteen Nachtr. f. 26, as *Echinocactus anisitsii.*

Figure 168 is copied from the first illustration above cited.

14. Gymnocalycium monvillei Pfeiffer, ined.*

Echinocactus monvillei Lemaire, Cact. Aliq. Nov. 14. 1838.

Globose, large, 20 cm. in diameter or more; ribs 13 to 17, broad and obtuse, strongly tubercled; areoles elliptic; spines 12 or 13, all radial, yellowish except the purplish bases, subulate, spreading, 3 to 4 cm. long, slightly curved; flowers large, nearly white, 6 to 8 cm. long; inner perianth-segments oblong, acute; scales on the ovary orbicular.

FIG. 170.—Gymnocalycium monvillei.

Type locality: Paraguay.

Distribution: Mountains of Paraguay.

Echinocactus contractus Hildmann (Monatsschr. Kakteenk. 1: 15, with plate. 1891) is a hybrid between this species and *G. gibbosum.*

Illustrations: Blühende Kakteen 1: pl. 10; Lemaire, Icon. Cact. pl. 1; Lemaire, Cact. Aliq. Nov. pl. 1, f. 1, 2; Möllers Deutsche Gärt. Zeit. 25: 474. f. 6, No. 4; Garten-Zeitung 4: 182. f. 42, No. 17; Monatsschr. Kakteenk. 27: 171; 29: 81, as *Echinocactus monvillei.*

Figure 169 is copied from the first illustration above cited; figure 170 is from a photograph contributed by Dr. Spegazzini, showing his understanding of this species. This may be different from the plant shown by figure 169, but we know the species only from descriptions and the illustrations cited above. We are unable to determine which of the figures is the more nearly correct.

FIG. 171.—Gymnocalycium melanocarpum.

FIG. 172.—Gymnocalycium uruguayense.

15. Gymnocalycium melanocarpum (Arechavaleta).

Echinocactus melanocarpus Arechavaleta, Anal. Mus. Nac. Montevideo 5: 220. 1905.

Simple, globose, 7 to 9 cm. in diameter; ribs 15, broad and rounded, strongly tubercled; spines all radial, 10 to 12, yellow when young, in age grayish, 2 to 2.5 cm. long; flowers nearly central; ovary nearly globular, bearing a few broad scales.

*The only reference to this binomial which we have seen is that of Schumann (Gesamtb. Kakteen 411) where it is used as a synonym.

Type locality: Near Paysandú, Uruguay.
Distribution: Northwestern Uruguay.
Illustration: Anal. Mus. Nac. Montevideo 5: pl. 15, as *Echinocactus melanocarpus*.
Figure 171 is copied from the illustration of the type plant above cited.

16. Gymnocalycium uruguayense (Arechavaleta).

Echinocactus uruguayensis Arechavaleta, Anal. Mus. Nac. Montevideo 5: 218. 1905.

Usually much depressed; ribs 12 to 14, strongly tubercled; areoles orbicular, grayish tomentose when young; spines 3, 1.5 to 2 cm. long, usually white; flowers 4 cm. long; inner perianth-segments linear-lanceolate.

Type locality: Paso de los Toros, Uruguay.
Distribution: Known only from the type locality.
Illustration: Anal. Mus. Nac. Montevideo 5: pl. 14, as *Echinocactus uruguayensis*.
Figure 172 is copied from the illustration of the type plant above cited.

FIG. 173.—Gymnocalycium megalothelos.

FIG. 174.—Gymnocalycium kurtzianum.

17. Gymnocalycium megalothelos (Sencke).

Echinocactus megalothelos Sencke in Schumann, Gesamtb. Kakteen 415. 1898.

Plant simple, somewhat depressed-globose, 10 cm. in diameter, but sometimes said to be short-columnar, in cultivation becoming bronzed; ribs 10 to 12, prominent, 10 to 12 mm. high, acute, deeply divided into tubercles; spines acicular, brownish; radial spines 7 or 8, spreading or sometimes ascending, 1 to 1.5 cm. long; central spine solitary, ascending or porrect, more or less curved, 2 to 3 cm. long; flower campanulate-funnelform, erect, 3 to 4 cm. long; outer perianth-segments broad, greenish purple with a broad ovate acute tip; inner perianth-segments pinkish white; scales on the ovary very broad with a pinkish tip.

Type locality: Paraguay.
Distribution: Paraguay.
This species was collected in Paraguay by Professor R. Chodat in 1915 and has flowered repeatedly in the New York Botanical Garden.
Plate XVIII, figure 1, shows the plant collected by Professor Chodat. Figure 173 is from a photograph of the same plant.

18. Gymnocalycium kurtzianum (Gürke).

Echinocactus kurtzianus Gürke, Monatsschr. Kakteenk. 16: 55. 1906.

Simple, globose but depressed, 10 to 15 cm. in diameter, naked at apex; ribs 10 to 18, divided into tubercles; radial spines 8, spreading, brownish, with recurved tips, 2.5 to 4 cm. long; central spine solitary, 3 cm. long; flowers large, white, reddish at base; scales on ovary large; inner perianth-segments obtuse.

Type locality: Probably Córdoba, Argentina.

Distribution: Argentina.

The plant is known to us only from descriptions and illustrations.

This species was named for Dr. Fritz Kurtz (1854–1920) who lived for many years in Argentina.

Illustrations: Monatsschr. Kakteenk. 17: 126; Blühende Kakteen 2: pl. 97, as *Echinocactus kurtzianus.*

Figure 174 is copied from the second illustration above cited.

19. Gymnocalycium damsii (Schumann).

Echinocactus denudatus bruennowianus Haage jr., Monatsschr. Kakteenk. 8: 37. 1898.
Echinocactus damsii Schumann, Gesamtb. Kakteen Nachtr. 119. 1903.

Simple, globular or somewhat depressed; ribs 10, green, tuberculate; spines all radial, straight, short, the longest 12 mm. long; flowers narrow, funnelform, 6 cm. long; inner perianth-segments oblong, white to light pinkish, spreading; scales on the ovary and flower-tube small, scattered; fruit oblong, 2.5 cm. long, 6 mm. in diameter, red.

FIG. 175.—Gymnocalycium damsii.

Type locality: Northern part of Paraguay.

Distribution: Paraguay.

The plant is known to us only from descriptions and illustrations.

Illustrations: Blühende Kakteen 2: pl. 83; Schumann, Gesamtb. Kakteen Nachtr. f. 27; Monatsschr. Kakteenk. 14: 76, as *Echinocactus damsii;* Cact. Journ. 1: 53, as *Echinocactus denudatus brunnowianus.*

Figure 175 is copied from the first illustration above cited.

20. Gymnocalycium platense (Spegazzini).

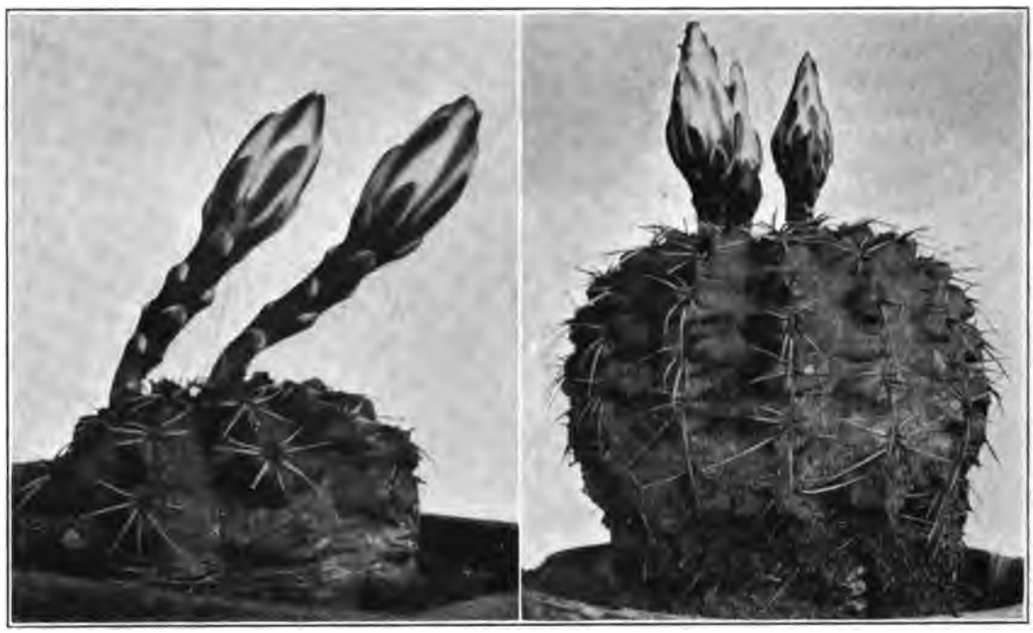
Echinocactus platensis Spegazzini, Contr. Fl. Vent. 28. 1896.
Echinocactus quehlianus F. Haage jr. in Quehl, Monatsschr. Kakteenk. 9: 43. 1899.
Echinocactus stenocarpus Schumann, Monatsschr. Kakteenk. 10: 181. 1900.
Echinocactus gibbosus platensis Spegazzini, Anal. Mus. Nac. Buenos Aires III. 2: 8. 1902.
Echinocactus platensis typicus Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 504. 1905.
Echinocactus platensis leptanthus Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 504. 1905.
Echinocactus platensis quehlianus Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 504. 1905.
Echinocactus platensis parvulus Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 505. 1905.
Echinocactus stellatus Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 505. 1905. Not Scheidweiler, 1840.
Echinocactus baldianus Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 505. 1905.

Plants small, depressed, half-hidden in the earth, 4 to 9 cm. broad, dull bluish green or purple or bronzed; ribs 8 to 12, broad and low, divided by cross lines into tubercles; tubercles with a horizontal or ascending chin-like projection; areoles when young white-felted; spines 3 to 6, 1 cm. long or less, brown with white tips, acicular, more or less appressed; flower inodorous, 6 cm. long, dull bluish green; tube and ovary bearing a few broad, short, rounded scales, these more or less purplish on the edge; outer perianth-segments white with a broad green stripe down the center; inner perianth-segments pure white; throat broad, purple within; filaments numerous, scattered over the throat; style short and thick, 2 cm. long; stigma-lobes cream-colored; ovary oblong.

Type locality: Argentina.
Distribution: Argentina.

This species has a wide range in southern Argentina and consists evidently of several races differing in armament and relative length of the perianth-tube and limb. A plant from the Berlin Botanical Garden sent as *Echinocactus quehlianus* produced flowers identical with those of a plant of *E. platensis* brought by Dr. Rose from Córdoba.

Illustrations: Blühende Kakteen **2**: pl. 105; Möllers Deutsche Gärt. Zeit. **25**: 474. f. 6, No. 21; Monatsschr. Kakteenk. **10**: 152; Schumann, Gesamtb. Kakteen Nachtr. f. 28, as *Echinocactus quehlianus;* Monatsschr. Kakteenk. **17**: 9; **29**: 141, as *Echinocactus platensis.*



FIGS. 176 and 177.—Gymnocalycium platense.

Plate XVIII, figure 2, shows a plant in flower, brought by Dr. Rose in 1915 to the New York Botanical Garden from near Córdoba, Argentina; plate XIX, figure 1, shows the flowering top of a plant received at the New York Botanical Garden from the Berlin Botanical Garden as *Echinocactus quehlianus.* Figure 176 is from a photograph of a plant from Argentina determined by Dr. Spegazzini as *Echinocactus platensis leptanthus.* Figure 177 is from a photograph contributed by Dr. Spegazzini; figure 178 is from a photograph also from Dr. Spegazzini, illustrating *Echinocactus baldianus.*

21. Gymnocalycium schickendantzii (Weber).

Echinocactus schickendantzii Weber, Dict. Hort. Bois 470. 1896.
Echinocactus delaetii Schumann, Monatsschr. Kakteenk. **11**: 186. 1901.

Usually simple, sometimes depressed, up to 10 cm. in diameter; ribs usually 7, broad, more or less tuberculate; spines 6 or 7, all radial, more or less spreading, the larger ones flattened; flowers often from the side of the plant as well as central, white or pinkish in age, 5 cm. long; inner perianth-segments oblong to spatulate, obtuse; scales on the ovary and flower-tube purplish, broad and rounded.

Type locality: Catamarca, Tucuman, Argentina.
Distribution: Northern Argentina.

M. E. Eaton del.

1. Top of flowering plant of *Gymnocalycium platense*.
2. Top of flowering plant of *Gymnocalycium schickendantzii*.
3. Top of flowering plant of *Homalocephala texensis*.
4. Fruit of same.
5. Seed of same.

(All natural size, except seed.)

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Shafer's No. 103 from Trancas flowered in Washington in June 1920. The flowers were erect and the perianth-segments waxy, becoming pinkish; the ribs were strongly tubercled.

FIG. 178.—Gymnocalycium platense.

FIG. 179.—Gymnocalycium schickendantzii.

Illustrations: De Laet, Cat. Gén. f. 19; Schumann, Gesamtb. Kakteen Nachtr. f. 29; Schelle, Handb. Kakteenk. 191. f. 124, as *Echinocactus schickendantzii;* Monatsschr. Kakteenk. 11: 187; Gartenwelt 7: 279; Gard. Chron. III. 33: suppl. plate, as *Echinocactus delaetii.*

Plate XIX, figure 2, shows a plant collected by Dr. Shafer at Andalgala, Argentina, in 1917 (No. 15), which flowered in the New York Botanical Garden in July 1918. Figure 179 is from a photograph contributed by Dr. Spegazzini, showing a plant from Córdoba, Argentina; figure 181, also from one of Dr. Spegazzini's photographs, shows another plant from Córdoba.

FIG. 180.—Gymnocalycium stuckertii.

FIG. 181.—Gymnocalycium schickendantzii.

22. Gymnocalycium stuckertii (Spegazzini).

Echinocactus stuckertii Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 502. 1905.

Plant globose, sometimes depressed, dull green, 6 to 6.5. cm. in diameter, 3.5 to 4 cm. high; ribs 9 to 11, obtuse; spines all radial, pinkish to brown, flattened, puberulent, 1 to 2.5 cm. long, somewhat spreading; flowers 4 cm. long, the tube rather short; inner perianth-segments nearly white; scales on the ovary and flower-tube scattered, broadly ovate, scarious-margined.

Type locality: Province of San Luis Potosí, Argentina.

Distribution: Northern Argentina.

This species was named for T. Stuckert who aided Dr. Spegazzini in his studies of the cacti of Argentina.

Figure 180 is from a photograph of an Argentine plant contributed by Dr. Spegazzini.

23. Gymnocalycium joossensianum (Bödeker).

Echinocactus joossensianus Bödeker, Monatsschr. Kakteenk. 28: 40. 1918.

Simple, depressed-globose, somewhat umbilicate at apex; ribs 6 to 9, obtuse, straight, somewhat tubercled; spines 6 to 9, the lower ones a little longer than the upper; flowers wine-red, nearly central, campanulate with a short tube; inner perianth-segments longer than the outer, oblong-obtuse; stigma-lobes 6; fruit fusiform; scales on the fruit few, red-tipped; seeds brownish yellow.

Type locality: Not definitely cited.

Distribution: Paraguay or northern Argentina.

We have not seen specimens of this plant, but from the illustration it is clearly a species of *Gymnocalycium*.

Illustration: Monatsschr. Kakteenk. 28: 41, as *Echinocactus joossensianus*.

19. ECHINOCACTUS Link and Otto, Verh. Ver. Beförd. Gartenb. 3: 420. 1827.

Plants very large, thick, cylindric and many-ribbed, or low and several-ribbed, the top clothed with a dense mass of wool or nearly naked; areoles very spiny, large, those on the upper part of old plants sometimes united; flowers from the crown of the plant, often partly hidden by the dense wool at the top, these usually yellow, rarely pink, of medium size; outer perianth-segments narrow, sometimes terminating in pungent tips; inner perianth-segments oblong, thinner than the outer, the inner ones obtuse; scales on the flower-tube numerous, imbricate, persistent, pungent; scales on the ovary small, often linear, their axils filled with matted wool; fruit densely covered with white wool, thin-walled, oblong; seeds blackish, smooth, shining, or rarely papillose, with a small subbasal hilum.

The generic name is from ἐχῖνος hedgehog, and κάκτος cactus, referring to the spiny armament.

The genus *Echinocactus*, as treated by Karl Schumann in his monograph (Gesamtb. Kakteen 290 to 452. 1898), contains 138 species, while more than 1,025 names have been used in the genus. Our review of *Echinocactus* convinces us that there is a number of distinct genera, several of which have already been proposed and others entirely new. Before making these segregates it was necessary to establish the type of the genus which was proposed in 1827. Before that time the species of *Echinocactus* were usually considered as belonging to the genus *Melocactus*. In that year Link and Otto* established the genus *Echinocactus*, describing and illustrating 14 species. The illustrations, however, must have been made and engraved before it was decided to establish the genus for they all bear a *Melocactus* legend. Since these 14 species do not belong to the same genus, it is important to establish the type.

In their introduction Link and Otto state that *Echinocactus tenuispinus* and *E. platyacanthus* have the flowers of a *Cereus* and, for this reason, as well as the absence of a cephalium, were separated as *Echinocactus*. The other 12 species referred there, whose flowers they did not know, were evidently thus referred from the supposed lack of a cephalium. It seems, therefore, the type of the genus *Echinocactus* should be either *E. tenuispinus* or *E. platyacanthus*. In the last paragraph of their paper they state that *E. tenuispinus* should probably be referred to *Cereus* and that *E. platyacanthus* and 7 other species belong to *Echinocactus*. We therefore designate *Echinocactus platyacanthus* Link and Otto as the type of the genus. We recognize 9 species of *Echinocactus*.

This group to which *E. platyacanthus* belongs is characterized by a densely woolly crown to the plant, very woolly, thin-skinned fruit, and smooth seed, with a lateral hilum. As thus characterized, the genus contains at least 6 Mexican species, although there are

* Verh. Ver. Beförd. Gartenb. 3: 420. 1827.

about a dozen species of this relationship which have been described; to these we append 3 species of the southwestern United States and border states of northern Mexico, one with smooth, the others with papillose seeds.

Echinocactus texensis has a similar woolly ovary, but the fruit is fleshy, with different seeds and purple flowers; this we regard as a new generic type.

Astrophytum with its 4 species, usually classed as *Echinocactus*, also has pubescent fruit, but is very different in other respects.

There are 2 other cacti from North America which bear wool on the ovary, *E. whipplei* and *E. polyancistrus*. These have only small scales on the ovary, bearing minute tufts of hairs in their axils and have very different seeds. We refer them to a new genus (see p. 212).

In South America there are 2 old genera with woolly fruit which have been associated with *Echinocactus*, namely, *Malacocarpus* and *Eriosyce*, both of which, in our opinion, are generically distinct.

KEY TO SPECIES.

A. Plants very large, often becoming cylindric (see No. 5).
- Spines all bright yellow ..... 1. *E. grusonii*
- Spines brown to gray, rarely some of them yellowish.
  - Inner perianth-segments linear-oblong, entire ..... 2. *E. ingens*
  - Inner perianth-segments oblong, more or less toothed or lacerate.
    - Spines all of one kind ..... 3. *E. visnaga*
    - Spines both radial and central.
      - Central spine solitary.
        - Flowers 4 to 5 cm. long; central spine 4 to 5 cm. long, nearly black. 4. *E. grandis*
        - Flowers 3 cm. long; central spine 3 cm. long, grayish in age ..... 5. *E. platyacanthus*
      - Central spines several ..... 6. *E. palmeri*

AA. Plants relatively small, subglobose.
- Seeds smooth and shining ..... 7. *E. xeranthemoides*
- Seeds papillose.
  - Flowers yellow ..... 8. *E. polycephalus*
  - Flowers pink ..... 9. *E. horizonthalonius*

1. Echinocactus grusonii Hildmann, Monatsschr. Kakteenk. 1: 4. 1891.

Plants single, depressed-globose, large, 2 to 13 dm. high or more, often 4 to 8 dm. in diameter, light green; ribs 21 to 37, rather thin and high; spines when young golden yellow, becoming pale and nearly white, but in age dirty brown; radial spines 8 to 10, subulate, 3 cm. long; central spines usually 4, up to 5 cm. long; flowers 4 to 6 cm. long, opening in bright sunlight, 5 cm. broad at top, the segments never widely spreading; flower-tube 3 cm. broad, covered with lanceolate, long-acuminate scales; outer perianth-segments long-acuminate, brownish on the outside, yellowish within; inner perianth-segments cadmium-yellow, with a silky luster, erect, narrowly lanceolate, acuminate, much shorter than the outer segments; stamens numerous, yellow, connivent, forming a thick cylinder in the center of the perianth; style yellow; stigma-lobes 12; ovary spherical, bearing acuminate scales with an abundance of wool in their axils; fruit oblong to spherical, 12 to 20 mm. long, thin-walled, covered with white wool or becoming naked below; seeds smooth, dark chestnut-brown, shining, 1.5 mm. long.

Type locality: Central Mexico.

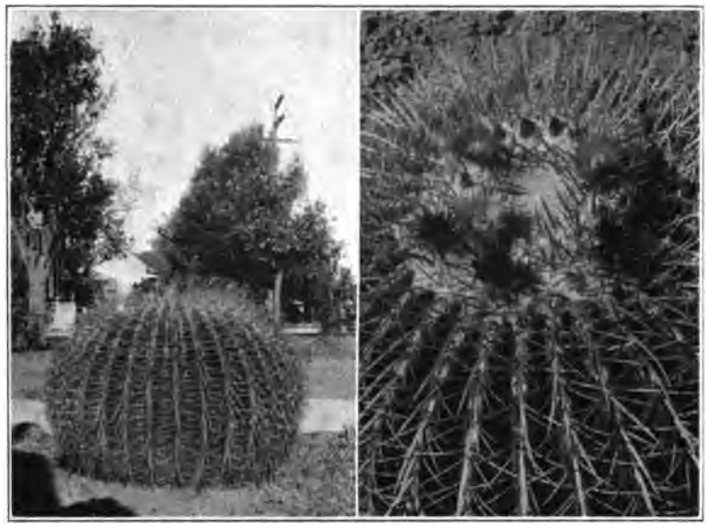
Distribution: San Luis Potosí to Hidalgo, Mexico.

This is a very attractive species and is much grown in collections, but usually only small plants are seen.

We are greatly indebted to Mr. E. C. Rost, a private grower of cacti in southern California and a very keen observer, not only for procuring for us flowers, fruits, and good photographs, but also for valuable observations. He writes that the flowers are deeply imbedded in the dense felt cushion and must actually be dug out. The depth to which the flowers are sunk is shown by a definite band near the top of the ovary. The flowers open in sun-light and the perianth-segments are nearly erect or slightly spreading. The stamens and style are erect. Under date of October 9, 1919, Mr. Rost sent us the following statement regarding this plant:

"In my garden these plants bloom at irregular intervals for a period of about six months each year. The first flower of the current season opened on May 15 and one is in blossom today, while a number of well-developed buds will open unless killed by unseasonable frosts. The hour of the day that the flower opens varies according to the time that the warm rays of the sun reach the plant. Just as soon, however, as the sun-light leaves the flower, it closes whether it be in the forenoon or afternoon. Clouds obscuring the sun for more than a few minutes or any artificial shade will cause the flowers to close. If conditions are suitable, the flowers will open for three consecutive days, closing each night. The perianth-segments of the flower separate very little.

"New plants can easily be obtained either by means of seeds or from cuttings. I have been very successful in obtaining cuttings by slicing off the top of a large plant which causes it to bud freely, and these buds can be cut off and will develop into good plants."



FIGS. 182 and 183.—Echinocactus grusonii.

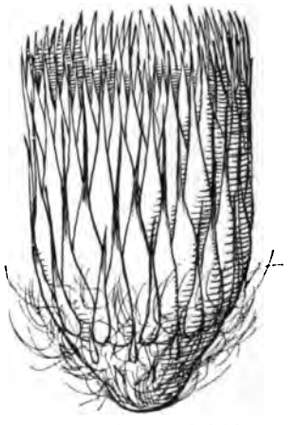


FIG. 184.—Flower of Echinocactus grusonii. ×0.8.

Echinocereus grusonii azureus is a form incidentally mentioned by Von Zeisold (Monatsschr. Kakteenk. 3: 141. 1893), while Nicholson refers here, as a synonym, *Echinocactus aureus* (Dict. Gard. Suppl. 334. 1900).

Echinocactus corynacanthus Scheidweiler and *Echinocactus galeottii* Scheidweiler (Allg. Gartenz. 9: 50. 1841), while doubtless referable to this genus, are more likely to belong to *Echinocactus grusonii* than to *E. ingens* where they are referred by Schumann.

Illustrations: Monatsschr. Kakteenk. 1: 4, 7; Gartenwelt 1: 429; Dict. Gard. Nicholson Suppl. 335. f. 356; Cact. Journ. 1: pl. for March; 165; 2: 42; Wiener Ill. Gart. Zeit. 29: f. 22, No. 1; Journ. Hort. Home Farm. III. 60: 144; Journ. Intern. Gard. Club 3: 10; Schelle, Handb. Kakteenk. f. 74; West Amer. Sci. 13: 6; Gartenwelt 7: 277; Möllers Deutsche Gärt. Zeit. 25: 474. f. 6, No. 8; De Laet, Cat. Gén. f. 6; f. 50, No. 1; Watson, Cact. Cult. ed. 2. 250. f. 94.

Figure 182 is from a photograph of a large plant grown by Mr. E. C. Rost at Alhambra, California, photographed by Miles E. Rost; figure 183 shows the flowering top of the plant; figure 184 is from a drawing of a flower from the same collection.

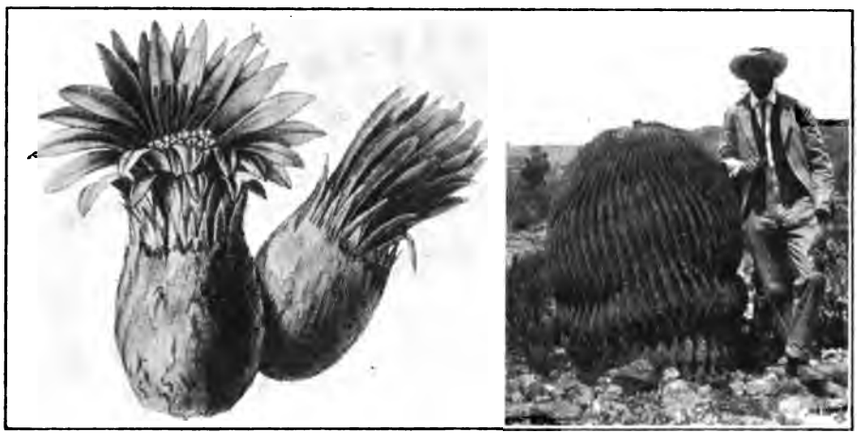
2. Echinocactus ingens Zuccarini in Pfeiffer, Enum. Cact. 54. 1837.

Globular to short-oblong, 15 dm. high, 12.5 dm. in diameter (but reported by Karwinsky to be 5 to 6 feet in diameter), glaucescent, somewhat purplish, very woolly at the top; ribs 8, obtuse, tuberculate; areoles large, distant, 2.5 to 3 cm. apart, bearing copious yellow wool; spines brown, straight, rigid, 2 to 3 cm. long; radial spines 8; central spine 1; perianth 2 cm. long, 3 cm. broad; inner perianth-segments linear-oblong, yellow, entire, obtuse; fruit ovoid, 3 cm. long, copiously covered by wool coming from the axils of small scales; stigma-lobes brick-red, about 8; seeds large, black, shining, reniform.

Type locality: Mexico.
Distribution: Mexico.

We refer here the plant collected at Ixmiquilpan by Dr. Rose in 1905 but we have seen no authentic material. The original description is based upon small juvenile plants but, according to Karwinsky, it is a very large plant fully 2 meters high. Pfeiffer's illustration of the flower, doubtless of the type, indicates that it is a true *Echinocactus*, but the narrow, entire, obtuse perianth-segments are very unlike those of any species we know. Schumann has referred here numerous names as synonyms, some of which may belong here while others do not.

Echinocactus karwinskii Zuccarini (Pfeiffer, Enum. Cact. 50. 1837) is referred here by Schumann. It is doubtless of this relationship. It is described as only 20 cm. high, with 13 to 20 ribs. Its very woolly apex would suggest this relationship. The species came from Pachuca. If it were identical with *Echinocactus ingens*, it would replace it as it has page priority. *E. karwinskianus* (Monatsschr. Kakteenk. 1: 126. 1891) is undoubtedly the same. *Melocactus ingens* Karwinsky (Pfeiffer, Enum. Cact. 54. 1837) is given as a synonym, but never published, *Echinocactus macracanthus* De Vriese (Tijdschr. Natuurl. Geschild. 6: 49. pl. 2. 1839) is referred here also by Schumann. It, too, has been described from a juvenile plant. From the illustration we would judge that it was of this relationship,



FIGS. 185 and 186.—Echinocactus ingens.

but certainly a different species. *Echinocactus minax* Lemaire (Cact. Aliq. Nov. 18. 1838) is referred by Schumann to *E. ingens*. Its spotted stem suggests a young plant of *E. grandis*. It is indeed a small plant, being only 5 inches high and is doubtless only a juvenile. It is described as globose, depressed, subumbilicate, green, with 13 ribs. The flowers were unknown and it is impossible to identify it definitely. *Echinocactus platyceras* Lemaire (Cact. Aliq. Nov. 19. 1838; *Echinofossulocactus platyceras* Lawrence in Loudon, Gard. Mag. 17: 318. 1841) is also described from a juvenile plant, but Lemaire states that it and *E. minax* are sometimes 6 and even 10 feet high. From his illustrations (f. 3 and 4) it is evidently related to *E. grandis* and *E. ingens*. *E. minax laevior* Lemaire (Labouret, Monogr. Cact. 192. 1853), *E. platyceras laevior* (Förster, Handb. Cact. 325. 1846), and *E. platyceras minax* Salm-Dyck (Förster, Handb. Cact. 324. 1846) must be different names for this plant. *Echinocactus helophorus* Lemaire (Cact. Gen. Nov. Sp. 12. 1839; *E. ingens helophorus* Schumann, Gesamtb. Kakteen 317. 1898) and its two varieties *laevior* and *longifossulatus* Lemaire (Cact. Gen. Nov. Sp. 13. 1839) are possibly the same as *E. minax* but all are without flowers and without definite habitat. *E. aulacogonus* Lemaire (Cact. Gen. Nov. Sp. 14. 1839) and the variety *diacopaulax* Lemaire (Cact. Gen. Nov. Sp.

15. 1839) are doubtless of this relationship. The origin was unknown and the flowers have not been described. *E. haageanus* Linke (Wochenschr. Gärtn. Pflanz. 1: 86. 1858) is referred here by Schumann. It is described, however, as only 8-ribbed and as coming from Peru. Its flowers are not known and it doubtless can never be identified. *Echinocactus tuberculatus* Link and Otto (Verh. Ver. Beförd. Gartenb. 3: 425. 1827; *Melocactus tuberculatus* Link and Otto, Verh. Ver. Beförd. Gartenb. 3: pl. 26. 1827), referred by Schumann to *E. ingens*, undoubtedly belongs elsewhere; it is described as having only 8 ribs and these obtuse; the spines are only 8. It was collected by Deppe in Mexico. Here Schumann refers *E. hystrix* Monville (Labouret, Monogr. Cact. 183. 1853), an unpublished homonym. *Echinocactus ingens edulis* Labouret (Monogr. Cact. 193. 1853; *Echinocactus edulis* Haage in Förster, Handb. Cact. 346. 1846) is of this relationship. It is well known that these species are used in central Mexico in making candy and hence the name, *edulis*. The variety *subinermis* (Schumann, Gesamtb. Kakteen 317. 1898) we do not know. *Echinocactus ingens grandis* (Monatsschr. Kakteenk. 17: 116. 1907) is only a name. *Echinocactus irroratus* Scheidweiler (Bull. Acad. Sci. Brux. 6[1]: 90. 1839; *Echinocactus ingens irroratus* Monville in Labouret, Monogr. Cact. 191. 1853) and *Echinocactus oligacanthus* Martius (Pfeiffer, Enum. Cact. 53. 1837) are usually referred here.

Echinocactus tuberculatus spiralis De Candolle (Mém. Mus. Hist. Nat. Paris 17: 115. 1828), a Mexican plant, is of uncertain relationship.

Echinofossulocactus macracanthus, E. helophora, E. helophora longifossulatus, and *E. karwinskianus*, all briefly described by Lawrence (Loudon, Gard. Mag. 17: 318. 1841), may belong here.

Illustrations: ? Goebel, Pflanz. Schild. 1: f. 46, as *Echinocactus aulacogonus* (seedling); Nov. Act. Cur. Nat. 19[1]: pl. 16, f 2,5; Engler and Drude, Veg. Erde 13: f. 30; Contr. U. S. Nat. Herb. 10: pl. 17, f. B; Abh. Bayer. Akad. Wiss. München 2: pl. 1, sec. 3, f. 6; Rev. Hort. 61: 568. f. 139; Karsten and Schenck, Vegetationsbilder 1: pl. 45, 47.

Figure 185 is copied from the second illustration cited above; figure 186 is from a photograph taken by Dr. Rose at Ixmiquilpan, Mexico, in 1905.

3. Echinocactus visnaga Hooker in Curtis's Bot. Mag. 77: pl. 4559. 1851.

Echinocactus ingens visnaga Schumann, Gesamtb. Kakteen 317. 1898.

Very large, 2 to 3 meters high, 7 to 10 dm. in diameter, glaucous-green, the summit covered with a mass of tawny wool; ribs 15 to 40, somewhat undulate but hardly tubercled, acute; areoles large, approximate and sometimes almost touching one another; spines 4, stout, subulate, all radial, the upper one erect, 5 cm. long, the 3 lower spreading, pale brown; flowers large, yellow, 7 to 8 cm. broad when fully expanded; inner perianth-segments numerous, oblong, spatulate, acute, serrate, 3.5 cm. long; stigma-lobes about 12, filiform; ovary elongated, 8 to 10 cm. long, crowned by the persistent perianth, densely lanate; scales on the upper part of ovary, at least, narrow, subpungent.

Type locality: Near San Luis Potosí.

Distribution: Highlands of San Luis Potosí, Mexico.

This species, one of the giant echinocacti of Mexico, was sent to Kew before 1846; several specimens were sent, one weighing a ton and estimated as being a thousand years old; Schumann refers this species to *Echinocactus ingens* and uses Hooker's plate to illustrate that species, but his description is different.

The first place of publication of this species is in some doubt. The Index Kewensis, as well as Hooker himself, the author of this species, cites Illustrated London News 1846, but although the species is illustrated here, accompanied by a popular account under the title of "Monster Cactus at Kew," in the text it is referred to as "*Cactus* (*Echinocactus*) of [or] *visnager*." Hooker (Curtis's Bot. Mag. 77: pl. 4559) cites also the Kew Garden Guide ed. 7. 53. 184(9?), but Mr. S. A. Skan writes us that it also appeared in the first edition 1847, p. 43.

A few years ago the governor of Tamaulipas sent a large plant to the City of Mexico, of which we have a photograph. This plant was 3 meters high, 1.3 meters in diameter, and weighed 2,000 kilograms.

Illustrations: Schumann, Gesamtb. Kakteen 54, as *Echinocactus ingens;* Illustr. London News 9: 245. 1846, as monster cactus; (?) Schelle, Handb. Kakteenk. 149. f. 76; Gartenwelt 7: 277; De Laet, Cat. Gén. f. 9, as *Echinocactus ingens visnaga;* Curtis's Bot. Mag. 77: pl. 4559; Fl. Serr. 6: pl. 616; Amer. Garden 11: 461; Dict. Gard. Nicholson 1: 501. f. 694; Jard. Fleur. 2: pl. 123; Watson, Cact. Cult. 125. f. 48; ed. 3. 47. f. 20.

Figure 187 is a reproduction of the plate in Curtis's Botanical Magazine above cited.

4. **Echinocactus grandis** Rose, Contr. U. S. Nat. Herb. 10: 126. 1906.

Simple, large, cylindric, 1 to 2 meters high, 6 to 10 dm. in diameter, dull green and, when young, with broad horizontal bands, very woolly at the crown; ribs on young plants as few as 8, broad, high, and more or less undulate, but in old plants very numerous and rather thin; areoles remote on young plants, confluent in old flowering plants; spines stout, subulate, distinctly banded, especially the stouter ones, at first yellowish but soon reddish brown; radial spines usually 5 or 6, 3 to 4 cm. long, central spine solitary, 4 to 5 cm. long, straight; flowers numerous, yellow, 4 to 5 cm. long; scales on the ovary linear, their axils bearing an abundance of wool covering the ovary with a dense felty mass; upper scales narrow, rigid, more or less spiny-tipped; outer perianth-segments ovate, long-apiculate, with ciliate margins; inner segments oblong, obtuse, retuse or apiculate, serrulate; fruit hidden in a mass of soft white wool, oblong, 4 to 5 cm. long; seeds black, shining, 2.5 cm. long.

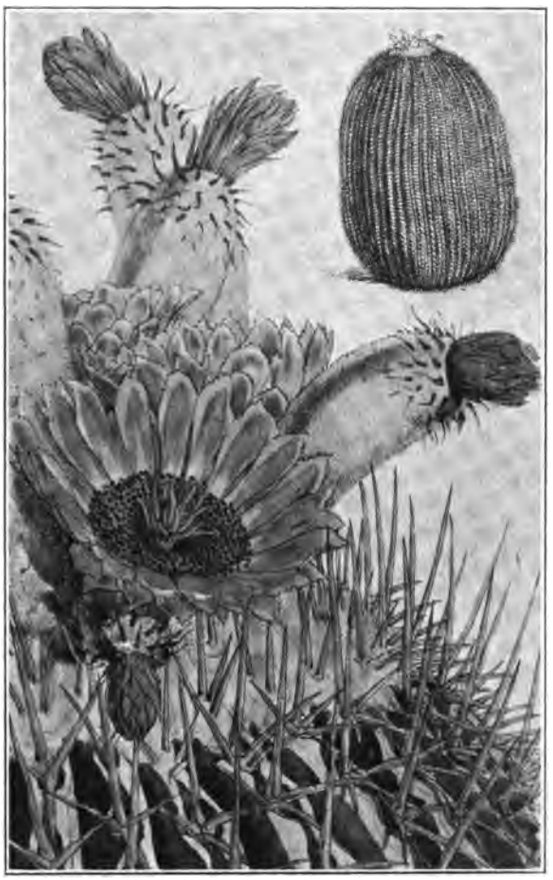


FIG. 187.—Echinocactus visnaga.

Type locality: Hills near Tehuacán, Puebla, Mexico.

Distribution: Limestone hills of Puebla, Mexico.

This is one of the very large species of *Echinocactus* and is very characteristic of the deserts of Puebla where it is often the most conspicuous plant of the landscape. The juvenile plants appear very different from the mature ones.

Illustrations: Monatsschr. Kakteenk. 12: 73; U. S. Dept. Agr. Bur. Pl. Ind. Bull. 262: pl. 18; Bull. Soc. Acclim. 52: 54. f. 13; Schelle, Handb. Kakteenk. f. 75, as *Echinocactus ingens;* Reiche, Elem. Bot. f. 163, as *Cereus ingens;* Nat. Geogr. Mag. 21: 701; Plant World 11^6: f. 3; Journ. N. Y. Bot. Gard. 8: f. 3; MacDougal, Bot. N. Amer. Des. pl. 17, in part; Monatsschr. Kakteenk. 27: 87; Möllers Deutsche Gärt. Zeit. 29: 439. f. 15.

5. **Echinocactus platyacanthus** Link and Otto, Verh. Ver. Beförd. Gartenb. 3: 423. 1827.

Stems nearly globular, 5 dm. high, 6 dm. broad, light green, very woolly at apex; ribs 21 to 30, acute; spines brownish at first, grayish in age; radial spines 4, spreading, 12 to 16 mm. long; central spines 3 or 4, spreading, 3 cm. long; flowers 3 cm. long, long-woolly; outer perianth-segments lanceolate, mucronate; inner perianth-segments obtuse, yellow; stigma-lobes 10.

Type locality: Mexico.

Distribution: Eastern Mexico.

Unfortunately, the type of the genus *Echinocactus* is now known only from the early descriptions and a single illustration. It seems to be quite distinct from the other species of the genus. The large giant cacti are very common in eastern Mexico, but it will require some very careful field work to disentangle the species.

Illustration: Link and Otto, Verh. Ver. Beförd. Gartenb. 3: pl. 14, as *Melocactus platyacanthus*.

FIG. 188.—Echinocactus palmeri.

6. Echinocactus palmeri Rose, Contr. U. S. Nat. Herb. **12**: 290. 1909.

Echinocactus saltillensis Hortus, Cact. Journ. 1: 100. 1898. Not Poselger, 1853.
Echinocactus ingens saltillensis Schumann, Gesamtb. Kakteen 317. 1898.
Echinocactus ingens subinermis Schumann, Gesamtb. Kakteen 317. 1898.

Stems 1 to 2 meters high, 4 to 5 dm. in diameter; ribs 12 to 26, or perhaps more in large plants; central spines 4, annular, the upper one erect, 6 to 8 cm. long, stout, straight, yellow above, brownish and somewhat swollen at base, the 3 lower ones shorter, spreading, similar in color and markings but

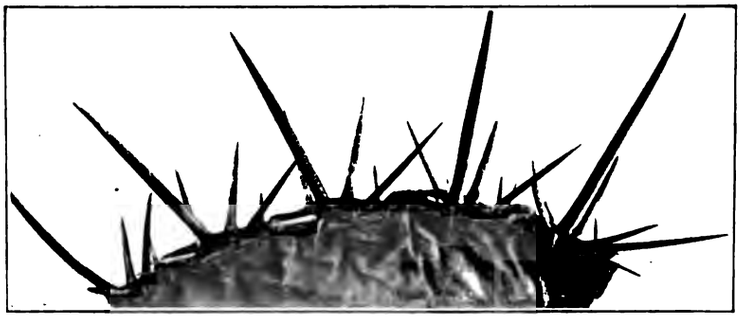


FIG. 189.—Echinocactus palmeri.

flattened; radial spines 5 to 8, much smaller, lighter colored and weaker; flowers yellow, rather small; perianth-segments about 2 cm. long, more or less lacerated along the margin; fruit about 3 cm. long, hidden in a dense covering of soft white wool; scales weak and bristle-tipped.

Type locality: Concepción del Rio, Zacatecas.

Distribution: Eastern northern Mexico.

This is the well-known *Echinocactus saltillensis* of horticultural collections, but is not the species first described under that name.

Not uncommon from southern Coahuila to Zacatecas. Professor F. E. Lloyd states that it is the most striking cactus in northern Zacatecas where it is found on the higher foothill slopes and on the hills on the slopes facing the south, with only very few exceptions.

Illustrations: Cact. Journ. 1: pl. for August, as *Echinocactus saltillensis;* Möllers Deutsche Gärt. Zeit. 25: 485. f. 18, as *Echinocactus ingens subinermis;* Contr. U. S. Nat. Herb. 12: pl. 23; Ann. Rep. Smiths. Inst. 1908: pl. 8; pl. 13, f. 1; Stand. Cycl. Hort. Bailey 2: f. 1373.

Figure 188 is from a photograph of a potted plant from San Luis Potosí, Mexico, collected by Dr. E. Palmer and photographed by Coney Doyle; figure 189 is from a photograph of a piece of a rib from near the top of an old plant collected by Dr. E. Palmer in 1904 (No. 314).

FIG. 190.—Echinocactus xeranthemoides.

7. **Echinocactus xeranthemoides** (Coulter) Engelmann in Rydberg, Fl. Rocky Mountains 579. 1917.

Echinocactus polycephalus xeranthemoides Coulter, Contr. U. S. Nat. Herb. 3: 358. 1896.

Cespitose, the stems globose, 2.5 to 18 cm. high, light green; ribs 13, interrupted or somewhat tubercled, sharp on the margin; areoles circular, about 1 cm. in diameter, often less than 2 cm. apart; spines 10 to 15, when young whitish pink, but in age a dirty gray, slender and rather stiff, more or less annulate; radial spines 3 to 4 cm. long, more or less curved backwards; central spines 4, 3 to 6 cm. long; one of them longer than the others, somewhat curved, rather stiff; flowers bright yellow, 5 cm. long; scales on the ovary and flower-tube linear, pink, papery, stiff, but not pungent, the longer ones 2 to 3 cm. long, persistent; perianth-segments narrowly oblong, more or less serrate, apiculate or cuspidate; stamens included; style yellow (?), included; fruit shortly oblong, 3 cm. long, densely and permanently white-woolly, dehiscing by a basal pore; seeds brownish black, shining, delicately reticulate, 2.5 mm. long.

Type locality: Kanab Plateau on the borders of Utah and Arizona.

Distribution: Extreme southwestern Utah and northern Arizona.

According to Dr. Coulter, this plant was given a specific name by Dr. Engelmann, but was never published by him. In 1917 Dr. Rydberg recognized it as a good species and used Engelmann's binomial for the first time. Through the kindness of Dr. J. M. Greenman, we have been able to study the material of Siler, now in the herbarium of the Missouri Botanical Garden, upon which this species is based. The material consists of two herbarium sheets as follows: No. 106799, without data, contains a single flower; No. 106798 contains two collections, one obtained in 1882 and the other in November 1881. These two collections show a cluster of spines, some scales from the ovary, and a quantity of seeds. Siler's plant from Kanab Mountains, referred to by Coulter, is missing. Dr. Coulter treated this plant as a variety of *Echinocactus polycephalus* and referred to it several other collections including Rusby's No. 2902 from Peach Springs, Arizona, which we have also studied.

In September 1920 James H. Ferriss sent us a fruit from a living plant collected by Mr. Willard N. Clute on the Painted Desert in northern Arizona which we identified as the same as Rusby's plant and now know to be the same as Siler's plant. We at once saw that the seeds were very different from those of *E. polycephalus* and this led to a restudy of our herbarium specimens which divided very definitely into the two species with good spine, flower, fruit, and seed characters.

Figure 190 is from a photograph made by T. Ashby Flynn, photographer in the U. S. National Museum, of the plant collected by Mr. Clute, referred to above.

8. Echinocactus polycephalus Engelmann and Bigelow in Engelmann, Proc. Amer. Acad. 3: 276. 1856.

Echinocactus polycephalus flavispinus Haage jr., Monatsschr. Kakteenk. 9: 43. 1899.

Solitary when young, in age forming large clumps of 20 to 30 heads, each globular to short-cylindric, sometimes as much as 7 dm. high but usually smaller; ribs 13 to 21, rather stout, 2 to 3 cm. high, somewhat undulate, nearly hidden under the dense spine-armament; areoles large, 10 to 12 mm. in diameter, 1 to 3.5 cm. apart; spines 7 to 15, when young covered with a downy felt but afterwards glabrate, reddish, subulate, more or less flattened, the radials 2.5 to 5 cm. long; central spines 4, stouter than the radials, 3 to 9 cm. long, more or less annulate; flowers yellow, 5 to 6 cm. long; scales on the ovary minute, hidden under the mass of long wool borne in their axils; scales on the flower-tube numerous, only a little longer than the wool, chartaceous, pungent; inner perianth-segments linear-oblong, 2.5 to 3 cm. long, entire, obtuse (see Meehan's plate); style slender, about 3 cm. long; fruit densely woolly, crowned by the somewhat spinescent scales, globose to oblong, dry, 1.5 to 2.5 cm. long, dehiscing by a basal pore; seeds angled, papillose, dull black, 3 to 4 mm. long; hilum large, lateral but below the middle of the seed; "embryo curved, the cotyledons buried in the large albumen." (Engelmann.)

FIG. 191.—Echinocactus polycephalus.

Type locality: On the Mojave River, California.

Distribution: Nevada, Utah, western Arizona, southern California to northern Sonora; reported from Lower California (Meehan, Rost).

Illustrations: Pac. R. Rep. 4: pl. 3, f. 4 to 6; Dict. Gard. Nicholson 4: 540. f. 22; Suppl. 335. f. 358; Förster, Handb. Cact. ed. 2. 204. f. 13: Goebel, Pflanz. Schild. 1: f. 12, 43; Meehan, Native Fl. Ferns U. S. 2: pl. 33; Monatsschr. Kakteenk. 16: 107; Schelle, Handb. Kakteenk. 163. f. 93; Watson, Cact. Cult. 115. f. 42.

Figure 191 is from a photograph taken by Dr. MacDougal near Barstow, California.

M. E. Eaton del.

1. Top of flowering plant of *Malacocarpus tephracanthus*.
2. Flowering plant of *Malacocarpus ottonis*.
3. Flowering plant of *Echinocactus horizonthalonius*.
4. Fruit of same.
5. Seed of same.

(All natural size, except seed.)

A. Hoen & Co.

9. Echinocactus horizonthalonius Lemaire, Cact. Gen. Nov. Sp. 19. 1839.

Echinocactus equitans Scheidweiler, Bull. Acad. Sci. Brux. 6[1]: 88. 1839.
Echinocactus horizonthalonius curvispinus Salm-Dyck, Cact. Hort. Dyck. 1849. 146. 1850.
Echinocactus horizonthalonius centrispinus Engelmann, Proc. Amer. Acad. 3: 276. 1856.
Echinocactus laticostatus Engelmann and Bigelow, Pac. R. Rep. 4: 32. 1856.
?*Echinocactus parryi* Engelmann, Proc. Amer. Acad. 3: 276. 1856.
Echinocactus horizonthalonius obscurispinus R. Meyer, Monatsschr. Kakteenk. 21: 181. 1911.

Simple, globular or sometimes depressed or short-cylindric, 4 to 25 cm. high, glaucous; ribs 7 to 13,* obtuse, often spirally arranged; spines 6 to 9, somewhat curved or straight, 2 to 4 cm. long, often very stout, more or less flattened, often annulate, reddish or sometimes blackish at base; central spine solitary, stouter than the radials; flowers pale rose to pink, 5 to 7 cm. long before expanding, broader than long when fully open; outer perianth-segments linear with more or less pungent tips; inner perianth-segments narrowly oblong, about 3 cm. long; throat of flower short and broad, covered with numerous stamens; tube of flower wanting or nearly so; filaments white; style pink; stigma-lobes pinkish to olive; ovary and fruit bearing linear scales, their axils very woolly; fruit dehiscing by a basal pore, oblong, red, 3 cm. long, clothed with long white wool; seeds 2 mm. long, more or less angled, brownish black, papillose; hilum large, lateral but below the middle.

Type locality: Not cited.

Distribution: Western Texas, southern New Mexico to Arizona,† and northern Mexico.

Echinocactus horizontalis (Förster, Handb. Cact. 327. 1846) is given as a synonym of this species but it was never described. According to F. E. Lloyd, it is known in Mexico as manca caballo.

This cactus is said to be used in making a Mexican candy.

Illustrations: Cact. Mex. Bound. pl. 32, f. 6, 7, as *Echinocactus parryi;* Schelle, Handb. Kakteenk. f. 71, as *E. horizonthalonius curvispinus*; Blühende Kakteen 2: pl. 117; Schumann, Gesamtb. Kakteen f. 51; Monatsschr. Kakteenk. 21: 179; Ann. Rep. Smiths. Inst. 1908: pl. 2, f. 5; Cact. Journ. 1: pl. for March; Dict. Gard. Nicholson 4: 539. f. 21; Suppl. 335. f. 357; Cact. Mex. Bound. pl. 31; 32, f. 1 to 5; Förster, Handb. Cact. ed. 2. f. 56, 57; Goebel, Pflanz, Schild. 1: f. 48; Lemaire, Icon. Cact. pl. 3; De Laet, Cat. Gén. f. 15; Orcutt, Rev. Cact. opp. 41; Watson, Cact. Cult. 106. f. 37; Remark, Kakteenfreund 14; Balt. Cact. Journ. 1: 68.

Plate XX, figure 3, shows a flowering plant collected by E. O. Wooton in the Tortiegas Mountains, Las Cruces, New Mexico, in 1905, which bloomed at the New York Botanical Garden in July 1917; figure 4 shows the fruit and figure 5 the seed of a plant collected by Mrs. S. L. Pattison in southern Texas in 1920.

UNIDENTIFIED SPECIES DESCRIBED AS ECHINOCACTUS.

The following species are recorded here because their generic relationship can not be determined. They are mostly described without flower or fruit.

ECHINOCACTUS AMAZONICUS Witt, Monatsschr. Kakteenk. 12: 29. 1902.

Cespitose, each plant 8 to 10 cm. broad, 4 to 5 cm. high, dark green, shining; ribs 11 to 13, separated by short intervals; areoles 2 cm. apart, when young woolly, becoming glabrate; spines 8, when young chestnut-brown, the lower one longest, sometimes 3 cm. long, the upper ones often only 6 mm. long; flowers and fruit unknown.

Type locality: In the Serra de Tucunaré on the Rio Tacutú in northern Brazil.

This plant is known only from the single collection of Alfred Wauer, and as flowers and fruit are both unknown its generic position is in doubt. It is certainly not an *Echinocactus* as we now treat the genus. It may be a young form of some species of *Cactus* (*Melocactus*).

*The number of ribs is almost always 8; in small plants we have seen as few as 7; Coulter has reported 10. *Echinocactus parryi* which we have referred here doubtfully was described as having 13.

†The Arizona record is based on a plant collected by Dr. Forrest Shreve in Pine County in 1918. Professor F. E. Lloyd reports finding the plant at Silver Bell Mountain but we have never seen his specimen.

ECHINOCACTUS ARACHNOIDEUS Scheidweiler, Bull. Acad. Sci. Brux. 6[1]: 90. 1839.*

Ovoid, 7.5 to 10 cm. long, 7.5 cm. in diameter; ribs 9 or 10, rounded, somewhat gibbose between the areoles, separated by acute intervals but these disappearing below; radial spines 10 to 12, spreading, equal, 1 cm. long; central spines 4, stouter than the radials, purplish at base; flowers and fruit unknown.

ECHINOCACTUS ARANEOLARIUS Reichenbach in Terscheck, Suppl. Cact. Verz. 2.

Oblong, obtuse; ribs 12; areoles prominent, white-lanate; radial spines 15 to 17, spreading, slender, straight, yellowish; central spines 5 to 7, porrect, very short, purplish; flowers and fruit not known.

According to Walpers (Repert. Bot. 2: 317. 1843) the species came from Montevideo.

ECHINOCACTUS ARMATISSIMUS Förster, Hamb. Gartenz. 17: 162. 1861.

"Normal specimens, which are before me, are an original stalk and a cutting raised therefrom. The first is 10 inches high, by 3½ inches in diameter, brownish green, lighter colored toward the crown, and is 14-ribbed. Ribs are rounded, furrowed rather deep, almost sharp, the areoles not far apart, sparsely covered with short gray wool, and not very deep. Spines: pearl gray, stiff, straight; radial spines: 9 to 11, spreading, extended, very dissimilar, 4 to 10 lines long; central spines: only 1, stiff, upright, 1½ to 1¾ inches long.

"The cutting on the other hand is 1 inch high, by 1½ inches in diameter, light green, and only 11 ribbed. The ribs, furrows, and areoles are like the original stalk. The spines upon the crown are brown, the rest pearl-gray. Radial spines: only 7 to 8, radiating, extended, 3 or 4 of the lower are longer (up to 9 lines long). Central spines: likewise only 1, upright, stiff, and up to 10 lines long.

"This belongs to the *Cephaloidei* and because of its strong spreading bundles of spines presents a peculiarly interesting aspect. Country: Peru and Colombia."

The above is a free translation of Förster's original description. We are not able to identify the plant. Schumann (Gesamtb. Kakteen 313. 1898) associates it with *Echinocactus ceratistes* but the descriptions of these two species do not read much alike.

ECHINOCACTUS CHRYSACANTHION Schumann, Gesamtb. Kakteen 396. 1898.

Usually simple, globose to short-cylindric, 5 to 6 cm. high, 5 cm. in diameter; ribs spiraled, tubercled; spines 30 to 40, setaceous, golden yellow to brown, 1.4 cm. long, straight; flower yellow, 17 to 18 mm. long; ovary naked.

Type locality: Province of Jujuy, Argentina.

Distribution: Known only from the type locality.

Schumann placed this species between *Echinocactus minusculus* and *E. microspermus*. From the description we judge that it is near the former species. We know it only from description. It may belong to *Rebutia*.

ECHINOCACTUS CUPULATUS Förster, Hamb. Gartenz. 17: 161. 1861.

We do not know this species. It is supposed to have come from Chile.

ECHINOCACTUS CUPREATUS Poselger in Förster, Handb. Cact. ed. 2: 602. 1885.

This species was described without flower and fruit and we are not able to suggest its relationship. Schumann discusses it briefly under *E. nigricans*; it is also Chilean. The name was listed in Seitz's Catalogue.

ECHINOCACTUS DEPRESSUS De Candolle, Prodr. 3: 463. 1828.

Subglobose, depressed at apex; ribs 20, somewhat tuberculate; radial spines 10 to 20; central spines 3 or 4; flowers and fruit unknown.

This plant from tropical America has never been identified. De Candolle cites *Melocactus* (?) *depressus* Salm-Dyck, as a synonym, and also refers here with a question

* Although we have never seen the reprint, this paper by Scheidweiler was repaged and issued separately, judging by references to it by Walpers (Repert. Bot. 2: 323. 1843) and Hemsley. According to Scheidweiler this plant came from Buenos Aires but Walpers and Hemsley refer it to Mexico. Schumann did not know it.

Cactus depressus Haworth (Syn. Pl. Succ. 173. 1812). Haworth's plant, however, was described as having 10 ribs and was believed to be related to *Cactus gibbosus*, that is to *Malacocarpus*.

ECHINOCACTUS ECHINATUS Forbes, Journ. Hort. Tour Germ. 152. 1837.

Like a hedgehog cactus; ribs 19; spines light brown, elongated.

This species is so briefly described that it can not be definitely identified. It is perhaps a *Ferocactus*. It is said to have come from Mexico.

ECHINOCACTUS GEISSEI Poselger in Schumann, Gesamtb. Kakteen 406. 1898.

Echinocactus geissei albicans Hildmann in Schumann, Gesamtb. Kakteen 406. 1898.

Neither has this species nor its variety been known to flower and as we have not seen the plants we are not able to suggest their relationship. The only illustration which we have seen (Möllers Deutsche Gärt. Zeit. 25: 474. f. 6, No. 14) indicates that it is not a true *Echinocactus*. It is recorded as from Chile or Bolivia.

ECHINOCACTUS HAMATUS Forbes, Journ. Hort. Tour Germ. 152. 1837.

Undoubtedly different from Mühlenpfordt's species of the same name. It presumably had hooked spines judging from the name; and was briefly described as having a depressed stem, 21 ribs, and 7 gray spines. Forbes reports it was introduced from Buenos Aires in 1833. It does not answer to any Argentine plant we know.

ECHINOCACTUS MALLETIANUS Lemaire, Allg. Gartenz. 13: 387. 1845.

Stems simple, depressed-globose or somewhat cylindric, very woolly at the top, 1 dm. high; ribs 15 to 17, more or less repand; spines straight, acicular, black; radial spines 5 or 6, suberect; central spine solitary; flowers and fruit unknown.

Type locality: Not cited.

Distribution: According to Schumann, Chile or Bolivia.

Dr. Rose obtained from L. Quehl a photograph of this species as it is now represented in collections. Its relationship is doubtful but it should certainly not be placed just after *E. horizonthalonius* as it was by Schumann.

ECHINOCACTUS MUTABILIS Förster, Hamb. Gartenz. 17: 161. 1861.

Simple, globose; ribs 10, sinuate and tuberculate, yellowish green to violet; radial spines 7 or 8, spreading, straight or somewhat curved, dull yellow; central spine solitary, straight, porrect.

Type locality: Peru.

Distribution: Reported from Peru, but since this species was discovered the southern provinces have been annexed by Chile. It is not of this genus.

ECHINOCACTUS ODIERI Lemaire in Salm-Dyck, Cact. Hort. Dyck. 1849. 174. 1850.

Echinocactus araneifer Labouret, Monogr. Cact. 248. 1853.

Echinocactus odierianus Monville in Weber, Dict. Hort. Bois 470. 1896.

Small, nearly globular, 5 cm. in diameter, purplish; ribs indefinite, broken up into tubercles, more or less spiraled; spines all radial, brownish to gray, 6 to 9, appressed, small, about 2 mm. long; flowers white, rose-colored without, about 5 cm. broad; outer perinth-segments narrowly lanceolate, acuminate, reddish green with dark purple tips; inner perianth-segments broadly lanceolate, acute, the margins serrate, white within, pale rose without; filaments white; style red, longer than the stamens; stigma-lobes 14, erect, flesh-colored.

Type locality: Not cited.

Distribution: Copiapo, Chile.

We do not know this species. It seems to have been well known in Europe at one time. Mr. Söhrens of Chile tells us he has seen it near Huasco, Chile. We are very uncertain as to its generic relationship. It may be a near relative of *Lobivia cumingii*.

Variety *mebbesii* Hildmann (Schumann, Gesamtb. Kakteen 413. 1898) is said to have more spreading, stouter, and lighter-colored spines and is more inclined to sucker than the typical forms. Other names associated with this species are the following: *E. odieri spinis nigris* Labouret (Monogr. Cact. 248. 1853) and *E. odieri magnificus* Hildmann (Monatsschr. Kakteenk. **5**: 184. 1895). It is said to have a very large flower as compared with the size of the plant.

ECHINOCACTUS PACHYCORNIS Mühlenpfordt, Allg. Gartenz. **14**: 371. 1846.

Depressed; ribs 7, thick, obtuse; areoles 18 mm. apart; radial spines 5; central spine 1; spines all reddish except the uppermost one and this horn-colored; flowers and fruit unknown.

Type locality: Mexico.

This seems to be only a juvenile plant of which all record is lost.

ECHINOCACTUS PULVERULENTUS Mühlenpfordt, Allg. Gartenz. **16**: 9. 1848.

Green, ovate or oblong-ovate; ribs 13, obtuse; areoles 4 mm. apart, grayish woolly; radial spines 6 or 7, stiff, 4 to 5 mm. long; central spine 1, 1¼ cm. long.

Type locality: Bolivia.

Both Mühlenpfordt and Schumann considered this species related to *Echinocactus ceratistes*, but it surely must be very different, judging from the brief description.

ECHINOCACTUS SPINA-CHRISTI Zuccarini in Pfeiffer, Enum. Cact. 59. 1837.

Globose, 15 cm. in diameter, dull green; ribs 13 or 14, acute, crenate; areoles large, oval, 15 or 20 mm. apart, when young white, velvety; spines stout, rigid, curved, black when young, paler at base, becoming yellow; radial spines 6 to 8, the lower spines stouter than the upper, 3.5 cm. long; central spine solitary, erect; flowers and fruit unknown.

Type locality: Southern Brazil.

To this species Pfeiffer referred *E. fischeri* as a synonym. Schumann lists it among the species unknown to him and afterwards (Gesamtb. Kakteen 468. 1898) under *Melocactus ferox* Pfeiffer, following Förster (Handb. Cact. 519. 1846).

Here also both Förster and Schumann refer *Echinocactus armatus* Salm-Dyck (Hort. Dyck. 341. 1834), a reference we very much question. Labouret (Monogr. Cact. 16. 1853) who takes the same view of this species says it is native of Mexico coming from Santa Rosa de Toliman.

Melocactus spina-christi Cels (Förster, Handb. Cact. 279. 1846) was never described but doubtless belongs here.

ECHINOCACTUS SPINIFLORUS Schumann, Gesamtb. Kakteen Nachtr. 88. 1903.

Usually simple, globose to cylindric, up to 6 dm. high, 1.5 dm. in diameter; ribs 20 or more, 1 to 1.5 cm. high; areoles circular, 4 to 5 mm. in diameter or near the crown of the plant 8 mm. in diameter, at first white-tomentose but in age naked; spines 14 to 20, spreading, straight, stiff, subulate, reddish yellow, unequal, the longest 2.5 cm. long; flowers 4 cm. long, 3.5 to 4 cm. broad, campanulate, rose-red; outer perianth-segments 8 mm. long, thin, spine-tipped; inner perianth-segments somewhat diverse, the outermost ones spinescent, the innermost ones not armed; stamens about two-thirds the length of the perianth; style about one-half the length of the longest stamens, surrounded at base with yellow wool; stigma-lobes 19; ovary turban-shaped, covered with awl-shaped prickly-tipped amber scales, these woolly in their axils.

Type locality: On Cerro Morro or Cerro Bianco.

Distribution: Argentina.

We know this species only from description and we are in doubt as to the relationship. It must, however, be excluded from *Echinocactus* and *Malacocarpus* and probably does not belong to the sub-tribe *Echinocactaneae*. According to Dr. Vaupel, the type can not be found in the herbarium of the Botanical Garden at Berlin, and the collector is unknown.

In the spinescent scales of the ovary and flower-tube and in the mass of wool at the base of the style it is similar to the two anomalous species which we have referred to *Lobivia*, viz., *L. thionanthus* and *L. chionanthus*. We have seen flowers in the herbarium of the Instituto de Botanica y Farmacologia collected by Dr. A. Dominguez on Cerro de Macha which probably belong to *Echinocactus spiniflorus* or to a closely related species. Unfortunately, we know nothing about the plant body from which these flowers come. A very similar plant was collected by Dr. C. Spegazzini at Jujuy, Argentina. This we know only from a photograph which is labeled *Echinocactus hylainacanthus*.

ECHINOCACTUS SPINOSISSIMUS Forbes, Journ. Hort. Tour Germ. 152. 1837.

Ribs 14 or 15; spines numerous; radial spines white; central spines 7 or 8, reddish brown, elongated.

The above description is compiled from Forbes's abbreviations and while it can not be definitely identified we suspect it refers to the so-called *Mammillaria spinosissima*.

Forbes did not have much knowledge of the cacti. He was the gardener of the Duke of Bedford who sent him to the Continent of Europe in 1835 where he obtained many cacti and on his return to England published a list of them, sometimes with brief descriptions.

The names had been given to him by Pfeiffer and others who were studying this family. As he published his list very promptly, many names appear there first or in the same year as in Pfeiffer's lists. *Mammillaria spinosissima* must have been in cultivation at the time of Forbes's visit, for it was published in 1838.

The following are mostly names which have been printed, but were unaccompanied by descriptions or, when described, so poorly or briefly characterized that no one has been able to identify them:

Echinocactus acutispinus Hildmann is only a catalogue name which Schumann (Monatsschr. Kakteenk. 5: 44. 1895) lists without description of any kind.

Echinocactus castaniensis (Monatsschr. Kakteenk. 5: 75. 1895) is only a name said to have come from Rünge's Catalogue.

Echinocactus cerebriformis Macloskie (Rep. Princeton Univ. Exped. Patagonia 8: 593. 1905) we do not know. Specimens could not be found in the Herbarium of Princeton University. It was described briefly as follows: A monstrosity, the ribs greatly contorted, and the spines short. It comes from the Rio Negro, northern Patagonia.

Echinocactus confertus, a garden name, appeared (Förster, Handb. Cact. 346. 1846) without description.

Echinocactus corrugatus Steudel (Nom. ed. 2. 1: 536. 1840) was based on *Cactus corrugatus* Loudon (Hort. Brit. 194. 1830) and is said to have come from Chile. Schumann did not know it. It was described originally as simply "corrugated." It may be referable to *Opuntia corrugata* (Cactaceae 1: 95).

Echinocactus dadakii Frič, we do not know, but it is said to come from South America. We find it offered for sale by Johnsens of Odesse, Denmark, in "Succulenta" for November 1920. It is stated (Monatsschr. Kakteenk. 31: 15. 1921) that the plant is small with few spines. The flowers are unknown.

Echinocactus flavicoma (Monatsschr. Kakteenk. 19: 139. 1909) is only mentioned in the place here cited. It is also advertised for sale by Frantz de Laet, but we have seen no description.

Echinocactus foliosus Steudel (Nom. ed. 2. 1: 536. 1840) is based on *Cactus foliosus* Gillies (G. Don in Loudon, Hort. Brit. 194. 1830. Not Willdenow, 1813). Schumann did not know it. It is said to come from Chile. If leafy, as described, it may be *Opuntia subulata*.

Echinocactus gigas Pfeiffer is only a name listed by Förster (Handb. Cact. 347. 1846).

Echinocactus glabrescens Weber (Monatsschr. Kakteenk. 8: 98. 1898) is only a name.

Echinocactus hemifossus Lemaire and its variety *gracilispinus* (Illustr. Hort. 5: Misc. 10. 1858) which came from Peru or Bolivia have never been identified.

Echinocactus intricatus Salm-Dyck (Allg. Gartenz. 13: 387. 1845) is a homonym which no student has been able to identify. The flowers and fruit were unknown and it is of doubtful origin. To it the name *Echinocactus criocerus* Lemaire (Labouret, Monogr. Cact. 178. 1853) has been referred.

Echinocactus junori (Monatsschr. Kakteenk. 8: 107. 1898), sometimes spelled *E. juori*, seems never to have been described.

Echinocactus latispinosus (Link and Otto, Verh. Ver. Beförd. Gartenb. 6: 431. 1830) is only a name.

Echinocactus longispinus Scheidweiler (Förster, Handb. Cact. 347. 1846) is only a name.

Echinocactus mamillosus Lemaire (Salm-Dyck, Cact. Hort. Dyck. 1844. 19. 1845) is only a name.

Echinocactus merckeri Hildmann (Monatsschr. Kakteenk. 5: 92. 1905) is only a catalogue name.

Echinocactus micracanthus Fennell (Förster, Handb. Cact. 347. 1846) is only a name.

Echinocactus montevidensis G. Don (Sweet, Hort. Brit. ed. 3. 283. 1839) is without description and probably does not belong to this genus.

Echinocactus olacogonus Audot (Rev. Hort. 6: 248. 1845) is briefly described as 58 cm. in diameter, flattened at the top. Galeotti is said to have had specimens in Brussells and Cels in Paris. The description follows a discussion of *Echinocactus stainesii*. Schumann makes no reference to the name and it is omitted from the Index Kewensis.

Echinocactus oreptilis Haage (Förster, Handb. Cact. 347. 1846) is only a name.

Echinocactus oxyacanthus (Forbes, Journ. Hort. Tour Germ. 152. 1837) is too briefly described to be definitely identified.

Echinocactus pelachicus (Monatsschr. Kakteenk. 20: 39. 1910) has never been described.

Echinocactus platycarpus (Förster, Handb. Cact. 347. 1846) is only a name.

Echinocactus plicatilis (Monatsschr. Kakteenk. 1: 22. 1891) is only a name.

Echinocactus pluricostatus (Monatsschr. Kakteenk. 4: 193. 1894) is only a name.

Echinocactus punctulatus (Monatsschr. Kakteenk. 5: 106. 1895) is only a garden name of Weber.

Echinocactus rebutii Weber (Monatsschr. Kakteenk. 5: 107. 1895) was listed by Schumann as growing in the Botanical Garden at Paris. We find no description or other information regarding it. It is possible that this was Weber's first name for *Rebutia minuscula*.

Echinocactus retusus Scheidweiler (Förster, Handb. Cact. 347. 1846) is only a name.

Echinocactus salmii Jacobi (Allg. Gartenz. 19: 9. 1851) is of unknown origin and we find no other mention of it.

Echinocactus sickmannii is unknown to us except from the description in Linnaea (12: Litt. 83. 1838). The only other reference which we have seen is that in the Index Kewensis (p. 1281) where it is credited to Lehmann. Steudel (Nom. ed. 2. 1: 537. 1840) credits it to South America. *E. sickmannii* of Förster (Handb. Cact. 347. 1846) and Labouret (Monogr. Cact. 266. 1853), without descriptions, probably refers to the same plant. Labouret credits the plant to the Berlin Gardens. Its relationship is doubtful while its definite origin is unknown. It is described as follows:

Depressed-globose, dull green, umbilicate at apex; ribs 20 or 21, acute, divided into oblong oblique tubercles; areoles white-tomentose; spines white, rigid; radial spines about 7, the upper ones smaller and more slender than the lower ones; central spine solitary, straight.

Echinocactus sparathacanthus Martius (Förster, Handb. Cact. 344. 1846), supposed to be from Mexico, is without description.

Echinocactus subgrandicornis Haage (Förster, Handb. Cact. 347. 1846) is only a name.

Echinocactus thelephorus (Hortus in Forbes, Journ. Hort. Tour Germ. 152. 1837) is very briefly described and we can not identify the plant.

Echinocactus verutum (Förster, Handb. Cact. 344. 1846), from Mendoza, was once grown in English gardens. It is only a name.

Echinocactus villiferus Scheidweiler (Förster, Handb. Cact. 347. 1846) is only a name.

Echinocactus wilhelmii is listed by Schumann (Monatsschr. Kakteenk. 5: 108. 1895) as from Hildmann's Catalogue.

20. HOMALOCEPHALA gen. nov.

Low, depressed or subglobose plants, strongly ribbed; spines stout; flowers central, rather large, day-blooming; outer perianth-segments very narrow, pungent; inner perianth-segments narrow, widely spreading; ovary covered with numerous linear pungent scales bearing in their axils masses of white wool; fruit globular, scarlet, becoming naked, at first juicy, bursting irregularly; seeds large, black, smooth, reniform.

The generic name is from ὁμαλός level, and κεφαλή head, referring to the depressed plant body.

We recognize only one species, first published as *Echinocactus texensis* Hopffer.

1. Homalocephala texensis (Hopffer).

Echinocactus texensis Hopffer, Allg. Gartenz. 10: 297. 1842.
Echinocactus lindheimeri Engelmann, Bost. Journ. Nat. Hist. 5: 246. 1845.
Echinocactus platycephalus Mühlenpfordt, Allg. Gartenz. 16: 9. 1848.
Echinocactus texensis gourgensii Cels in Labouret, Monogr. Cact. 196. 1853.
Echinocactus texensis longispinus Schelle, Handb. Kakteenk. 161. 1907.

FIG. 192.—Homalocephala texensis.

Usually simple, sometimes globose, but generally much depressed, in large plants 30 cm. broad, 10 to 15 cm. high; ribs 13 to 27, very prominent, acute; areoles only 2 to 6 to a rib, densely white-felted when young, large; radial spines usually 6, rarely 7, spreading or recurved, more or less flattened, unequal, 1.2 to 4 cm. long, or rarely 5 cm. long, reddish, more or less annulated; central spine solitary, longer than the radials, 3 to 6.5 cm. long, 3 to 8 mm. broad, much flattened, strongly annulate; flowers broadly campanulate, 5 to 6 cm. long and fully as broad, scarlet and orange below, pink to nearly white above; outer perianth-segments linear with more or less lacerate margins and terminated by long spinose tips; inner perianth-segments with less pungent tip or without any, but with strongly lacerate margins; filaments red; stigma-lobes 10, linear, pale pink; scales on the ovary and flower-tube linear, pungent; fruit scarlet, globular, 16 to 40 mm. in diameter, nearly smooth when mature, at first pulpy but becoming dry and apparently splitting open unequally; seeds large, uniform, black, smooth, shining, somewhat flattened, angled on the back, 3 mm. broad; hilum lateral, large, depressed; "embryo curved or hooked with the foliaceous cotyledons buried in the large albumen" (Engelmann).

Type locality: Texas; type grown in a botanical garden from seed.

Distribution: Southeastern New Mexico, Texas, and northern Mexico.

The flowers of this species open for four days in bright sunlight, closing at night; they are delicately fragrant.

This plant shows great variation in the size of the fruit and in the way it ripens and dehisces the seeds. In 1921 Mr. Robert Runyon sent us a box of very large fruits, almost twice as large as any previously studied; none of these fruits split open as it ripened.

Dr. C. R. Ball writes of this plant as follows: "This plant is extremely abundant on the high plains of western and northern Texas. In establishing farms in this section large

numbers of this cactus are plowed out in the breaking of the sod land. Occasionally, the farmers gather them and haul them to the margins of the field and there build fences much like the stone walls so familiar in New England. The plants are easily corded and the strong sharp spines make the fences quite formidable."

Echinocactus courantianus Lemaire is given as a synonym of this species by Labouret (Monogr. Cact. 196. 1853) and seems never to have been described. *Melocactus laciniatus* Berlandier is only mentioned by Engelmann (Cact. Mex. Bound. 27. 1859).

The plant is called devil's pincushion and devil's head cactus.

Illustrations: Alianza Cientifica Universal 3: opp. 222; Cact. Mex. Bound. pl. 33, f. 1 to 6; Blühende Kakteen 1: pl. 50; Gartenflora 32: 20; 37: pl. 1286; Monatsschr. Kakteenk. 12: 57; Dict. Gard. Nicholson 1: 501. f. 693; Rümpler, Sukkulenten 185. f. 103; Ann. Rep. Smiths. Inst. 1908: pl. 2, f. 1; Förster, Handb. Cact. ed. 2. f. 58, 59; Orcutt, Rev. Cact. 56; Schulz, 500 Wild Fl. San Antonio pl. 13; Thomas, Zimmerkultur Kakteen 39; Schelle, Handb. Kakteenk. f. 89; Watson, Cact. Cult. 121. f. 46, as *Echinocactus texensis*.

Plate XIX, figure 3, shows a plant sent by Dr. MacDougal to the New York Botanical Garden from Austin, Texas, in 1902, which flowered in 1904 and 1905; figure 4 shows a fruit, painted by D. G. Passmore in Washington, D. C., of a plant collected by F. E. Upton near Fort Worth, Texas, in 1907; figure 5 shows a seed from a plant collected by Robert Runyon at Brownsville, Texas, in 1920. Figure 192 is from a photograph of a plant which flowered and fruited in Washington, D. C. This was sent from Fort Worth, Texas, by F. E. Upton in 1907.

21. ASTROPHYTUM Lemaire, Cact. Gen. Nov. Sp. 3. 1839.

Plants globular or more or less flattened to short-cylindric; ribs few, very prominent, more or less covered with white, radiating, hairy scales; spines usually wanting, weak or subulate in two species; flowers borne at the top of the plant, large, yellowish with a reddish center, soon fading, persistent, campanulate to short-funnelform; fruit globular, covered with brown, scarious, imbricating scales, these woolly in their axils, and more or less pungent; seeds dark brown, smooth and shining, with a large depressed hilum having inturned margins.

Four species, all Mexican, are here recognized; the type species is *Astrophytum myriostigma* Lemaire.

The generic name is from ἀστήρ star, and φυτόν plant, referring to the star-like shape of the plant.

KEY TO SPECIES.

Spines wanting.
- Plants globular to columnar; flowers 4 to 6 cm. long ..... 1. *A. myriostigma*
- Plants much depressed; flowers 3 cm. long ..... 2. *A. asterias*

Spines present.
- Spines flat, ribbon-like, hardly pungent ..... 3. *A. capricorne*
- Spines subulate ..... 4. *A. ornatum*

1. Astrophytum myriostigma Lemaire, Cact. Gen. Nov. Sp. 4. 1839.

Cereus callicoche Galeotti in Scheidweiler, Bull. Acad. Sci. Brux. 6¹: 88. 1839.
Echinocactus myriostigma Salm-Dyck, Cact. Hort. Dyck. 1844. 22. 1845.
Astrophytum prismaticum Lemaire, Cactées 50. 1868.
Echinocactus myriostigma columnaris Schumann, Gesamtb. Kakteen 321. 1898.
Echinocactus myriostigma nudus R. Meyer, Monatsschr. Kakteenk. 22: 136. 1912.

Plants solitary or cespitose, globular to cylindric, up to 6 dm. high; ribs usually 5, sometimes 6, 8, or rarely even 10, very broad, acute, usually covered with white woolly scales but sometimes naked; spines wanting, at least on old plants; flowers 4 to 6 cm. long; outer perianth-segments narrow, with brown scarious tips; inner perianth-segments oblong; scales on ovary and flower-tube scarious, imbricated, narrow, often bristly tipped, with long wool in their axils.

Type locality: Not cited.
Distribution: Northern central Mexico.

Dr. C. A. Purpus who knows this species very well writes that it has two very different forms. The gray or grayish-white form grows near Torreon, in Cerro de la Bola, and in the mountains near Viesca, all in Coahuila. The more greenish lower form is abundant in the Sierra la Tabla, near Guascama or Minas de San Rafaél, San Luis Potosí. It usually grows in the open mesa among broken stones, but is sometimes associated with other plants, such as *Opuntia leptocaulis*.

Cereus inermis Scheidweiler (Bull. Acad. Sci. Brux. 6^1: 88. 1839), usually referred here as a synonym, was never published.

Echinocactus myriostigma hybridus is advertised by Haage and Schmidt, but we do not know its origin; the varieties, *columnaris* and *nudus*, are in the trade.

Many hybrids are produced with this species as one of the parents. In 1896 (Monatsschr. Kakteenk. **6**: 20) Fl. Radl* named and described twelve hybrids, while in 1907 Schelle† (Handb. Kakteenk. 151, 152) listed 59 hybrid names under *Echinocactus myriostigma*.

Illustrations: Monatsschr. Kakteenk. **29**: 81; Gartenwelt **15**: 537, as *Echinocactus myriostigma columnaris;* Lemaire, Icon. Cact. pl. 16; Schelle, Handb. Kakteenk. f. 78; Möllers Deutsche Gärt. Zeit. **25**: 474. f. 6, No. 11; 486. f. 19; **29**: 89. f. 11; Cycl. Amer. Hort. Bailey **2**: 515. f. 746; Stand. Cycl. Hort. Bailey **2**: f. 1374; Gardening **9**: 617; Gard. Chron. III. **52**: f. 103; Loudon, Encycl. Pl. ed. 3. 1376. f. 19368; Blühende Kakteen **2**: pl. 110; Engler and Prantl, Pflanzenfam. 3^{6a}: f. 56, E; f. 62; Monatsschr. Kakteenk. **6**: 22; **12**: 4; **18**: 9; **29**: 141; Schumann, Gesamtb. Kakteen f. 1; Curtis's Bot. Mag. **71**: pl. 4177; Gartenwelt **15**: 537; **17**: pl. opp. 412; Journ. Hort. Home Farm. III. **59**: 631; De Laet, Cat. Gén. f. 16, 22; Watson, Cact. Cult. 112. f. 40; ed. 3. f. 27; Gard. Chron. III. **12**: 789. f. 129, as *Echinocactus myriostigma;* Förster, Handb. Cact. ed. 2. 461. f. 54; Cact. Journ. **1**: pl. for September; 164; Illustr. Hort. **8**: pl. 292; Rümpler, Sukkulenten 188. f. 106; Orcutt, West Amer. Sci. **13**: 3; Gartenflora **34**: 56. f. 1885; Monatsschr. Kakteenk. **3**: 159. f. III; **7**: 170; Lemaire, Cactées 50. f. 4; Deutsche Gärt. Zeit. **5**: 369; Orcutt, Rev. Cact. opp. 41.

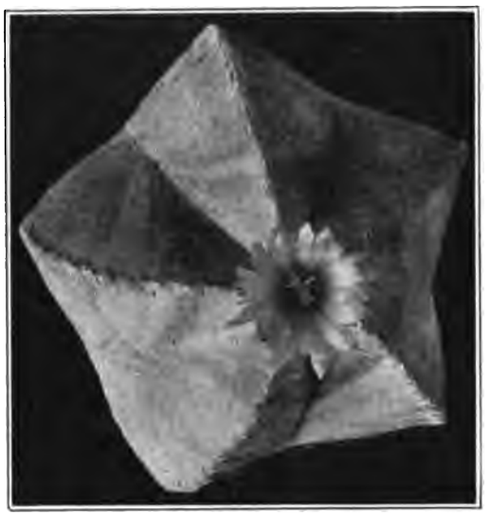


FIG. 193.—Astrophytum myriostigma.

Plate XXII, figure 3, shows a flowering plant in the collection of the New York Botanical Garden, received in 1901 from M. Simon, St. Ouen, Paris, France, which has since bloomed several times. Figure 193 is from a photograph of a plant collected by C. A. Purpus in northern Mexico in 1905.

2. Astrophytum asterias (Zuccarini) Lemaire, Cactées 50. 1868.

Echinocactus asterias Zuccarini, Abh. Bayer. Akad. Wiss. München 4^2: 13. 1845.

Plant much depressed, only 2 to 3 cm. high, about 8 cm. broad; ribs 8, very low, almost flat on top, the surface bearing numerous depressions, containing tufts of wool; areoles prominent, circular, felted, 4 to 5 mm. apart, spineless; flowers 3 cm. long, yellow.

*The names given by Radl are as follows: *amabile, bedinghausii, beguinii, conspicuum, imperiale, lapaixii, lesaunieri, mirabile, octogonum, princeps, regale, and schilinskyi.*

†Under this species Schelle lists the following hybrids: *amabilis, amoenus, bedinghausi, beguinii, bellus, candidus, cereiformis, cinerascens, cinerascens brevispinus, cinerascens crassisipinus, cinerascens longispinus, cinerascens parvimaculatus, conspicuus, cornutus, cornutus candidus, crenatus, darrahii, delaeti, diadematus, elegantissimus, erectus, formosus, gardei, glabrescens, hanburyi, imperialis, incanus, incomparabilis, inermis, insignis, jusberti, lapaixi, laurani, lesaunieri, lophothele, lophothele cereiformis, martini, mirabilis, nobilis, octagonus, pentagonus, pictus, princeps, quadratus, rebuti, regalis, regulare, regulare spinosum, robustum, schilinskyi, schumannii, speciosus, spectabilis, spiralis, splendidus, variegatus, weberi,* and *zonatus.*

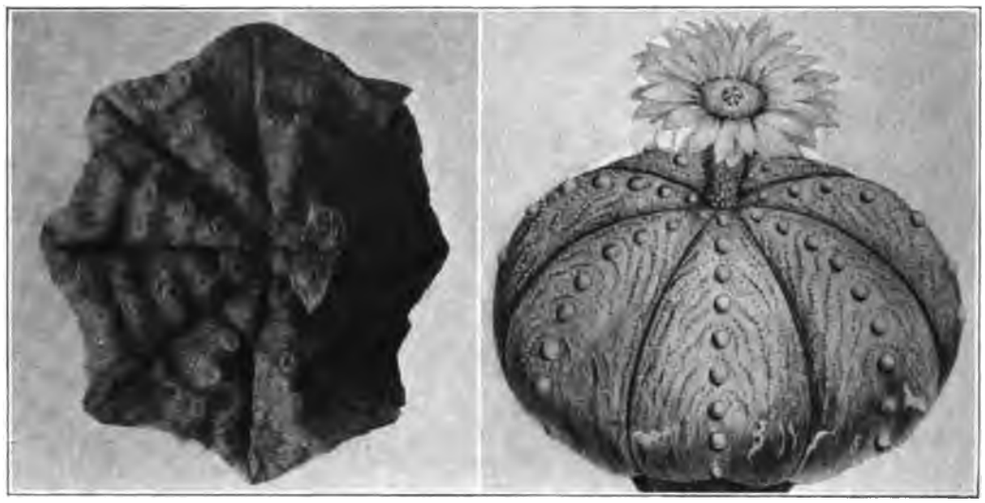
Type locality: Mexico.

Distribution: Northern Mexico.

This species has, until now, been known only from the type collection of Karwinsky which should be at Munich. In 1912 Dr. Rose obtained a specimen from Dr. Radlkofer, but without label, which we now suspect is a part of the original material of Karwinsky.

Señor Octavio Solis wrote us that in 1919 he obtained specimens of this plant at Barretillas, Nuevo León, and also at Ciudad Guerrero, Tamaulipas. The four specimens which he took back to the City of Mexico soon died. In May 1921 Señor Solis sent one of the specimens from Ciudad Guerrero which had been collected by Professor Francisco Contreras and we have been able to confirm his identification. Señor Solis says that the plant is known as peyote.

Illustration: Abh. Bayer. Akad. Wiss. München 4^2: pl. 3, as *Echinocactus asterias*.



FIGS. 194 and 195.—Astrophytum asterias.

Figure 194 is from a photograph of the plant from Munich referred to above; figure 195 is copied from the illustration above cited.

3. Astrophytum capricorne (Dietrich).

Echinocactus capricornis Dietrich, Allg. Gartenz. 19: 274. 1851.
Echinocactus capricornis minor Rünge, Monatsschr. Kakteenk. 2: 82. 1892.

Subglobose or short-cylindric, up to 25 cm. high; ribs 7 or 8, high, acute; areoles distant, 2 to 3 cm. apart; spines several, more or less flattened, weak, hardly pungent, brown, 3 to 5 cm. long; flowers 6 to 7 cm. long, widely spreading when in full bloom; outer perianth-segments reddish, gradually passing into the lemon-yellow inner perianth-segments with papery tips, orange at base, spatulate, acute or cuspidate at the apex, entire or more or less toothed; stamens numerous, attached over all the inner surface of the flower-tube; style slender, cream-colored; stigma-lobes linear, somewhat spreading, 5 to 9, cream-colored; seeds 2.5 mm. broad, shining.

Type locality: La Rinconada, Mexico.

Distribution: Northern Mexico.

Dr. C. A. Purpus writes that this plant is found on the hills of lime and slate formation south of Parras. It is very scarce and grows associated with *Lophophora williamsii* and *Ariocarpus furfuraceus*. He believes that the variety *minor* is specifically distinct; this he found at Peña and Villareal, Coahuila, and also on Cerro de la Bola and in the Sierra de la Paila.

Various hybrids have been produced by crossing this species with *Astrophytum ornatum* and *A. myriostigma.*

Echinocactus capricornis major (Monatsschr. Kakteenk. **19**: 139. 1909) has never been described.

Illustrations: Ann. Rep. Smiths. Inst. **1908**: pl. 5, f. 2; Monatsschr. Kakteenk. **14**: 183; **26**: 135; Gartenwelt **15**: 537; Schelle, Handb. Kakteenk. f. 80, 81; Alianza Cientifica Universal **3**: pl. opp. 190; Möllers Deutsche Gärt. Zeit. **25**: 474. f. 6, No. 1; Blanc, Cacti 41. No. 420; Karsten and Schenck, Vegetationsbilder **2**: pl. 20, as *Echinocactus capricornis;* Monatsschr. Kakteenk. **2**: 82; Floralia **42**: 372, as *Echinocactus capricornis minor;* De Laet, Cat. Gén. f. 5, as *Echinocactus capricornis major.*

Plate XXI, figure 1, is from a painting by E. I. Schutt of a plant collected by C. A. Purpus at Parras, Mexico.

4. Astrophytum ornatum (De Candolle) Weber.*

Echinocactus ornatus De Candolle, Mém. Mus. Hist. Nat. Paris **17**: 114. 1828.
Echinocactus mirbelii Lemaire, Cact. Aliq. Nov. 22. 1838.
Echinocactus holopterus Miquel, Linnaea **12**: 2. 1838.
Echinocactus tortus Scheidweiler, Bull. Acad. Sci. Brux. **5**: 493. 1838.
Echinofossulocactus mirbelii Lawrence in Loudon, Gard. Mag. **17**: 318. 1841.
Echinocactus ghiesbrechtii Salm-Dyck, Allg. Gartenz. **18**: 395. 1850.
Echinopsis haageana Linke, Wochenschr. Gärtn. Pflanz. **1**: 86. 1858.
Echinocactus ornatus mirbelii Croucher, Gard. Chron. **1873**: 983. 1873.
Echinocactus haageanus Rümpler in Förster, Handb. Cact. ed. 2. 469. 1885.
Echinocactus ornatus glabrescens Schumann, Gesamtb. Kakteen 324. 1898.

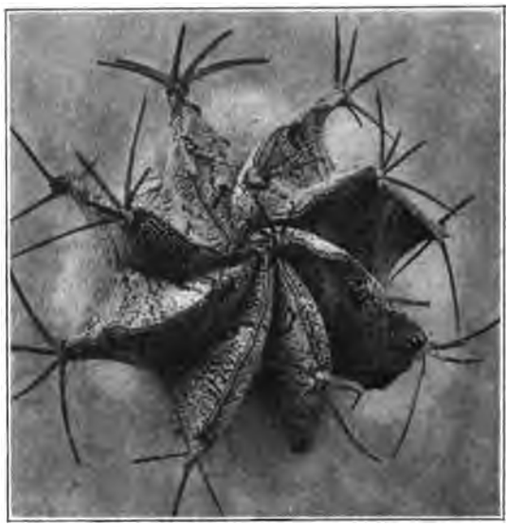


FIG. 196.—Astrophytum ornatum.

Subglobose to cylindric, 3 dm. high or more, the surface more or less white-floccose; ribs 8, rather prominent, 2 cm. high or more, acute; areoles 1 to 5 cm. apart, felted; spines 5 to 11, subulate, yellow at first, becoming brown, often 3 cm. long; flowers large, lemon-yellow, 7 to 9 cm. broad; inner perianth-segments broadly oblong, with a broad, more or less serrated apex; scales on ovary very narrow.

Type locality: Mexico.

Distribution: Hidalgo and Querétaro, Mexico.

Dr. Rose collected this species in the deserts of eastern Querétaro, Mexico, in 1905 (No. 10286).

Astrophytum glabrescens Weber (Dict. Hort. Bois 467. 1896) is given as a synonym of this species, although it has never been described.

Echinopsis haageana Linke (Wochenschr. Gärtn. Pflanz. **1**: 86. 1858), although originally described as probably from Peru, doubtless belongs to this species.

Illustrations: Blühende Kakteen **2**: pl. 113; Cact. Journ. **1**: pl. for September; 54; Ann. Rep. Smiths. Inst. **1908**: pl. 13, f. 4; Schumann, Gesamtb. Kakteen f. 56; Gard. Mag. **4**: 279; Möllers Deutsche Gärt. Zeit. **25**: 474. f. 6, No. 19, as *Echinocactus ornatus;* Blanc, Cacti 50. f. 581; Schelle, Handb. Kakteenk. f. 79, as *Echinocactus ornatus mirbelii;* Möllers Deutsche Gärt. Zeit. **25**: 485. f. 17, as *Echinocactus ornatus glabrescens;* Gartenwelt **15**: 537, as *Echinocactus mirbelii ornatus;* Gard. Chron. **1873**: 983. f. 196, as *Echinocactus mirbelii;* Cact. Journ. **2**: 173.

Figure 196 is from a photograph furnished by Dr. W. E. Safford of the plant collected by Dr. Rose near Higuerillas, Mexico, in 1905.

*This binomial has several times been credited to Weber, but has never been formally published.

22. ERIOSYCE Philippi, Anal. Univ. Chile 41: 721. 1872.

A very large, globular to thick-cylindric cactus; ribs numerous, very spiny; flowers from the apex of the plant, campanulate, the tube longer than the perianth-segments; outer perianth-segments linear, more or less pungent; inner perianth-segments narrow, acutish; stamens borne near the base of the flower-tube, included; ovary densely clothed with matted wool; fruit oblong, becoming dry, dehiscing by a basal pore, very spiny above; seeds rather large, dull, black-pitted with a subbasal sunken hilum.

This very interesting plant, well known to the Chileans under the name of sandillon, is not very well understood botanically. It has no near relatives in South America but resembles in habit and fruit some of our giant species of *Echinocactus* in Mexico. It has good technical differences and we have no hesitancy in following the late Dr. Rudolph Philippi in regarding it as constituting a distinct genus.

Only one species is here recognized, a native of Chile, although Mr. Söhrens states that there are two very definite forms, one of which is more slender, with narrow fruit, the other nearly globular and with globular fruit. The genus was based on *Echinocactus sandillon* Remy.

The generic name is from ἔριον wool, and σῦκον fig, referring to the woolly fruit.

1. Eriosyce ceratistes (Otto).

Echinocactus ceratistes Otto in Pfeiffer, Enum. Cact. 51. 1837.
Echinocactus sandillon Remy in Gay, Fl. Chilena 3: 14. 1847.
Echinocactus auratus Pfeiffer, Abbild. Beschr. Cact. 2: under pl. 14. 1847.
Echinopsis aurata Salm-Dyck, Cact. Hort. Dyck. 1849. 39. 1850.
Eriosyce sandillon Philippi, Anal. Univ. Chile 41: 721. 1872.

Simple, 3 to 10 dm. high, usually 2 to 3 dm. in diameter or even more, very woolly at apex; ribs numerous, 21 to 35, but fewer in young plants, while in old ones sometimes more; areoles large, usually 3 cm. apart; spines 11 to 20, nearly equal, straight or somewhat curved, 2.5 to 3.5 cm. long, subulate, yellowish when young; flowers 3 to 3.5 cm. long, yellowish red, opening for 3 or 4 hours and then whitening; inner perianth-segments 1.5 cm. long; fruit 4 cm. long; seeds 3 mm. long.

FIG. 197.—Eriosyce ceratistes.

Type locality: Bellavista, Chile.

Distribution: Provinces of Santiago, Aconcagua, and Coquimbo, Chile.

Dr. Rose did not see wild plants of this species but he obtained fruit through Mr. Söhrens and also obtained a photograph of a fine plant growing in the Botanical Garden at Santiago.

The plant is found only in the mountains, growing at an altitude of 2,000 meters or more, and flowers abundantly. Dr. Philippi states that he counted 74 flowers and fruits on one plant.

Although this plant was first described as an *Echinocactus*, Pfeiffer questions whether it might not be a *Melocactus*. The original spelling of the specific name, *ceratistes*, was changed by Salm-Dyck to *ceratitis*.

The two varieties *Echinocactus ceratistes melanacanthus* (Labouret, Monogr. Cact. 246. 1853; *E. melanacanthus* Monville) and *Echinocactus ceratistes celsii* (Labouret, Monogr. Cact. 246. 1853) may possibly belong here. To the latter variety Labouret doubtfully refers *Echinocactus copiapensis* Monville, not Pfeiffer. To the latter binomial seems to have been applied the name *Ceratistes copiapensis* which we have seen mentioned only by Labouret.

Illustrations: Schelle, Handb. Kakteenk. 147. f. 73; Engler and Drude, Veg. Erde 8: pl. 15, f. 30; Schumann, Gesamtb. Kakteen f. 53, as *Echinocactus ceratites;* Cact. Mex. Bound. pl. 33, f. 7, as *Echinocactus sandillon.*

Figure 197 is from a photograph of a plant in the Botanical Garden at Santiago, Chile, taken by Mrs. J. N. Rose, in 1914.

23. **MALACOCARPUS** Salm-Dyck, Cact. Hort. Dyck. 1849. 24. 1850.

Plants globose to short-cylindric, either simple or clustered; ribs definite, usually straight, either entire or broken up into more or less definite tubercles; areoles felted, especially when young, spine-bearing; flowers from the center of the plant, broad and short, mostly yellow; perianth funnelform to subrotate; stigma-lobes in typical species red; ovary densely covered with scales bearing an abundance of wool and usually bristles in their axils; fruit soft, rose-red or crimson; seeds brown or black, tuberculate with a broad truncate base; hilum white.

Prince Salm-Dyck, who established the genus, assigned 6 species of *Echinocactus* to it, of which *E. corynodes* Pfeiffer was the first and is therefore taken by us as the generic type.

Schumann treats the group as a subgenus of *Echinocactus;* he assigns 3 species to it, all from the State of Rio Grande do Sul, Brazil; Arechavaleta, who follows Schumann's treatment, describes 6 species from Uruguay. Besides those heretofore treated in the subgenus *Malacocarpus,* we refer here most of the species assigned by Schumann to the subgenus *Notocactus.*

We recognize 29 species, all from South America and all found south of the Equator. The generic name is from μαλακός soft, and καρπός fruit, referring to the fleshy fruit.

Key to Species.

A. Plants globular to stout-cylindric.
  B. Areoles of the ovary and flower-tube long-hairy or long-woolly.
    C. Spines 4 cm. long or less, straight.
      D. Flowers yellow.
        Ribs acute.
          Spines subulate ..... 1. *M. tephracanthus*
          Spines acicular.
            Spines yellow ..... 2. *M. schumannianus*
            Spines white or becoming silvery.
              Spines 3 to 7 ..... 3. *M. grossei*
              Spines 9 or 10 ..... 4. *M. nigrispinus*
        Ribs obtuse or rounded.
          Ribs spirally arranged, broken into tubercles.
            Spirals many; plant gray ..... 5. *M. reichei*
            Spirals few; plant brown ..... 6. *M. napinus*
          Ribs straight or nearly so, undulate or continuous.
            Perianth short-funnelform.
              Perianth-tube very stout ..... 7. *M. apricus*
              Perianth-tube relatively slender.
                Plant deeply umbilicate; spines slender ..... 8. *M. concinnus*
                Plant slightly umbilicate; spines short ..... 9. *M. tabularis*
            Perianth campanulate to subrotate.
              Spines setaceous or acicular.
                Ribs 30 to 40; radial spines up to 40 or more ..... 10. *M. scopa*
                Ribs 21 or fewer; radial spines much fewer than 40.
                  Ribs very low and rounded ..... 11. *M. pulcherrimus*
                  Ribs prominent.
                    Areoles only 4 to 7 mm. apart ..... 12. *M. muricatus*
                    Areoles more separated.
                      Inner perianth-segments obtuse or merely apiculate ..... 13. *M. linkii*
                      Inner perianth-segments acute or acuminate ..... 14. *M. ottonis*
              Spines stouter, subulate.
                Inner perianth-segments 2 to 3 cm. long.
                  Spines terete.
                    Spines slender, slightly curved ..... 15. *M. catamarcensis*
                    Spines stout, rigid ..... 16. *M. patagonicus*
                  Spines flattened.
                    Central spines not much longer than the radials ..... 17. *M. erinaceus*

KEY TO SPECIES—continued.

Central spines definitely longer than the radials.
Spines strongly curved ..... 18. *M. langsdorffii*
Spines straight ..... 19. *M. mammulosus*
Inner perianth-segments about 1 cm. long ..... 20. *M. islayensis*
DD. Flowers salmon or red.
Ribs about 13, obtuse; flowers salmon ..... 21. *M. strausianus*
Ribs 30 or more, acutish; flowers red ..... 22. *M. haselbergii*
CC. Spines elongated, the central ones 1.5 to 7 cm. long, curved; flowers orange-red .. 23. *M. maassii*
BB. Areoles of ovary and flower-tube with tufts of short hairs.
Spines stout, subulate ..... 24. *M. tuberisulcatus*
Spines slender, acicular.
Spines long, much curved ..... 25. *M. curvispinus*
Spines short, nearly straight ..... 26. *M. mammillarioides*
AA. Plants becoming slender-cylindric and much elongated ..... 27. *M. leninghausii*
AAA. Species not grouped ..... 28. *M. graessneri*, 29. *M. escayachensis*

1. Malacocarpus tephracanthus (Link and Otto) Schumann, Fl. Bras. 4^2: 243. 1890.

Echinocactus tephracanthus Link and Otto, Verh. Ver. Beförd. Gartenb. 3: 422. 1827.
*Echinocactus acuatus** Link and Otto, Verh. Ver. Beförd. Gartenb. 3: 424. 1827.
Echinocactus sellowii Link and Otto, Verh. Ver. Beförd. Gartenb. 3: 425. 1827.
Melocactus tephracanthus Link and Otto, Verh. Ver. Beförd. Gartenb. 3: pl. 16, f. 2. 1827.
Melocactus sellowii Link and Otto, Verh. Ver. Beförd. Gartenb. 3: pl. 22. 1827.
Melocactus acuatus Link and Otto, Verh. Ver. Beförd. Gartenb. 3: pl. 23. 1827.
Echinocactus sellowianus Pfeiffer, Enum. Cact. 55. 1837.
Echinocactus sessiliflorus Mackie in Curtis's Bot. Mag. 64: pl. 3569. 1837.
Echinocactus tetracanthus Lemaire, Cact. Aliq. Nov. 15. 1838.
Echinocactus courantii Lemaire, Cact. Aliq. Nov. 20. 1838.
Echinocactus sessiliflorus pallidus Monville in Lemaire, Cact. Gen. Nov. Sp. 88. 1839.
Echinocactus sessiliflorus tetracanthus Monville in Lemaire, Cact. Gen. Nov. Sp. 88. 1839.
Cereus tephracanthus Steudel, Nom. ed. 2. 1: 336. 1840.
Malacocarpus sellowianus Salm-Dyck, Cact. Hort. Dyck. 1849. 25. 1850.
Malacocarpus sellowianus tetracanthus Salm-Dyck, Cact. Hort. Dyck. 1849. 25. 1850.
Malacocarpus courantii Salm-Dyck, Cact. Hort. Dyck. 1849. 25. 1850.
Echinocactus tephracanthus spinosior Labouret, Monogr. Cact. 171. 1853.
Echinocactus courantii spinosior Monville in Labouret, Monogr. Cact. 171. 1853.
Echinocactus sellowianus tetracanthus Labouret, Monogr. Cact. 172. 1853.
Malacocarpus martinii Rümpler in Förster, Handb. Cact. ed. 2. 454. 1885.
Malacocarpus sellowii Schumann, Fl. Bras. 4^2: 238. 1890.
Malacocarpus sellowii tetracanthus Schumann, Fl. Bras. 4^2: 239. 1890.
Malacocarpus tetracanthus Meyer, Monatsschr. Kakteenk. 4: 143. 1894.
Echinocactus sellowii martinii Schumann, Gesamtb. Kakteen 297. 1898.
Echinocactus acuatus sellowii Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 494. 1905.
Echinocactus acuatus tetracanthus Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 494. 1905.
Echinocactus sellowii macrocanthus Arechavaleta, Anal. Mus. Nac. Montevideo 5: 230. 1905.
Echinocactus sellowii macrogonus Arechavaleta, Anal. Mus. Nac. Montevideo 5: 232. 1905.
Echinocactus sellowii aculatus Arechavaleta, Anal. Mus. Nac. Montevideo 5: 234. 1905.
Echinocactus sellowii turbinatus Arechavaleta, Anal. Mus. Nac. Montevideo 5: 235. 1905.
Echinocactus fricii Arechavaleta, Anal. Mus. Nac. Montevideo 5: 244. 1905.
Echinocactus pauciareolatus Arechavaleta, Anal. Mus. Nac. Montevideo 5: 246. 1905.
Echinocactus sellowii courantii Gürke, Monatsschr. Kakteenk. 18: 149. 1908.
Echinocactus sellowii typicus Gürke, Monatsschr. Kakteenk. 18: 149. 1908.

Simple, globular or somewhat depressed, up to 15 cm. in diameter, woolly at apex; ribs 18 to 22, acute, rather high, hardly undulate on the margin, light green; areoles 1.5 to 2 cm. apart; spines 4 to 6, straight or curved backward, the longest 2 cm. long; flowers from the woolly apex of the plant, 4 to 4.5 cm. long, broader than long when fully expanded; perianth-segments yellow, narrowly oblong, mucronate-tipped; stamens and style slightly exserted; stigma-lobes red; perianth deciduous; fruit small, 1 cm. long, purple, fleshy, scaly; scales ovate, bearing hairs and bristles in their axils; seeds black, 1 mm. long.

Type locality: "Rio Grande," perhaps better, Rio Grande do Sul, Brazil.

Distribution: Brazil, Argentina, and Uruguay.

Walpers (Repert. Bot. 2: 275. 1843) referred *Echinocactus acuatus spinosior* Lemaire to *E. courantii*. This variety was not described, however, until 1839 when Lemaire (Cact. Gen. Nov. Sp. 87. 1839) assigned it to Monville and referred to it, as a synonym, *Echinocactus suberinaceus* Lemaire.

*The specific name was originally given by Link and Otto as above, but Schumann changed it, writing both *Echinocactus acutatus* and *Melocactus acutatus*. Don (Gen. Syst. 3: 163. 1834) writes the name *E. arcuatus*.

Schumann refers *Echinocactus martinii* Cels (Gesamtb. Kakteen 297. 1898) as a synonym of *E. sellowii*, but we do not know that the binomial has been formally made.

Illustrations: Anal. Mus. Nac. Montevideo 5: pl. 18; Pfeiffer and Otto, Abbild. Beschr. Cact. 1: pl. 1, as *Echinocactus sellowii;* Schelle, Handb. Kakteenk. 143. f. 68, as *E. sellowii martinii;* Anal. Mus. Nac. Montevideo 5: pl. 21, as *E. sellowii turbinatus;* Anal. Mus. Nac. Montevideo 5: pl. 19, as *E. sellowii macrocanthus;* Anal. Mus. Nac. Montevideo 5: pl. 20, as *E. sellowii macrogonus;* Link and Otto, Verh. Ver. Beförd. Gartenb. 3: pl. 16, f. 2, as *Melocactus tephracanthus;* Pfeiffer, Abbild. Beschr. Cact. 2: pl. 6, as *Echinocactus tetracanthus;* Curtis's Bot. Mag. 64: pl. 3569, as *E. sessiliflorus;* Anal. Mus. Nac. Montevideo 5: pl. 25, as *E. fricii;* Anal. Mus. Nac. Montevideo 5: pl. 26, as *E. pauciareolatus;* Link and Otto, Verh. Ver. Beförd. Gartenb. 3: pl. 23, as *Melocactus acuatus;* Lemaire, Icon. Cact. pl. 12; Martius, Fl. Bras. 4^2: pl. 49; Monatsschr. Kakteenk. 4: 141, as *Malacocarpus sellowii;* Link and Otto, Verh. Ver. Beförd. Gartenb. 3: pl. 22, as *Melocactus sellowii.*

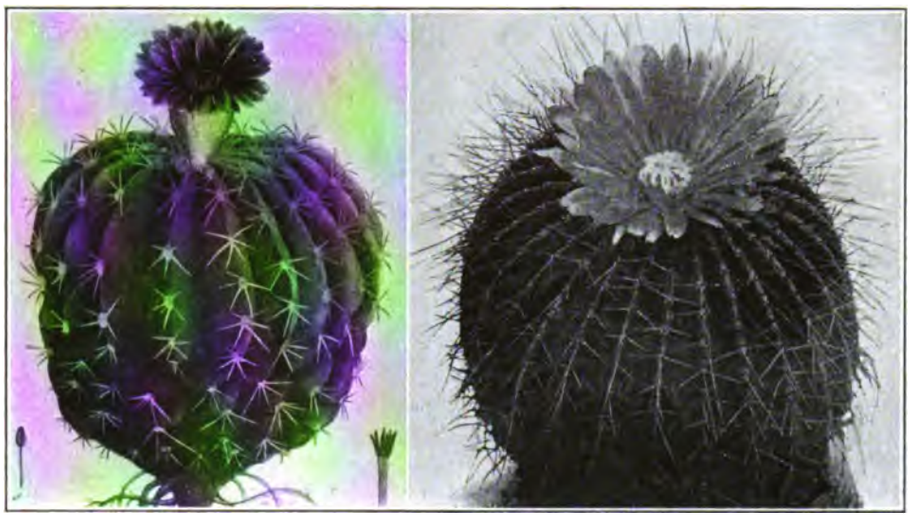


FIG. 198.—Malacocarpus tephracanthus. FIG. 199.—Malacocarpus schumannianus.

Plate XX, figure 1, shows the top of a plant collected by Dr. Shafer at Concordia, Argentina, in 1917 (No. 119), which flowered in the New York Botanical Garden in 1918; plate XXI, figure 2, shows a plant obtained by Dr. Rose from Dr. Spegazzini in 1915, labeled *Echinocactus sellowianus,* which flowered in the New York Botanical Garden in 1917. Figure 198 is copied from Pfeiffer and Otto's illustration of *Echinocactus sellowii;* figure 203 is copied from the illustration given by Link and Otto of *Melocactus acuatus.*

2. Malacocarpus schumannianus (Nicolai).

Echinocactus schumannianus Nicolai, Monatsschr. Kakteenk. 3: 175. 1893.
Echinocactus schumannianus longispinus Haage jr. in Quehl, Monatsschr. Kakteenk. 9: 43. 1899.

Simple, globose or elongated, becoming bent or procumbent, sometimes over a meter long and 1 to 4 dm. in diameter; ribs about 30, low, acute, dull green; spines 4 to 7, setaceous, brownish to yellow; flowers central, large, citron-yellow, 4.5 cm. long; perianth-segments oblong, obtuse, spreading; scales on ovary with wool and bristles in their axils.

Type locality: Said to be in the territory of Misiones, Paraguay.

Distribution: Paraguay and northeastern Argentina.

Illustrations: Schumann, Gesamtb. Kakteen f. 65; Monatsschr. Kakteenk. 7: 55; Schelle, Handb. Kakteenk. 178. f. 111; Chodat, Veg. Paraguay 1: f. 87, 88, 89, as *Echinocactus schumannianus.*

Figure 199 is copied from the first illustration cited above.

3. Malacocarpus grossei (Schumann).

Echinocactus grossei Schumann, Monatsschr. Kakteenk. 9: 44. 1899.

Globose to depressed or sometimes cylindric, sometimes up to 1.7 meters high; ribs usually 16, acute, somewhat crenate; areoles small, circular; spines 3 to 7, spreading, acicular, curved, white, the longer ones 4 cm. long; flower large, funnelform, citron-yellow, 4 cm. long, when fully expanded broader than long; perianth-segments oblanceolate to spatulate, obtuse, serrate above; stamens numerous, short; style slender, longer than the stamens; stigma-lobes 12 to 17, linear, white, recurved; scales on the ovary numerous, linear, purplish, with wool and bristles in their axils; fruit short-oblong, 2.5 cm. long, 2 cm. in diameter; seeds black, 2 mm. long.

FIG. 200.—Malacocarpus grossei.

FIG. 201.—M. napinus.

Type locality: Paraguay.

Distribution: Paraguay, between Carepegua and Acaay.

The species is known to us only from illustrations and description; it and the preceding one are much the largest of the genus, as known to us. The Blühende Kakteen shows the spines as yellow, but they were originally described as white.

Illustrations: Blühende Kakteen 2: pl. 89; Möllers Deutsche Gärt. Zeit. 25: 474. f. 6, No. 18; Monatsschr. Kakteenk. 9: 44; Schumann, Gesamtb. Kakteen Nachtr. f. 19, as *Echinocactus grossei.*

Figure 200 is copied from the first illustration cited above.

4. Malacocarpus nigrispinus (Schumann).

Echinocactus nigrispinus Schumann, Monatsschr. Kakteenk. 9: 45. 1899.

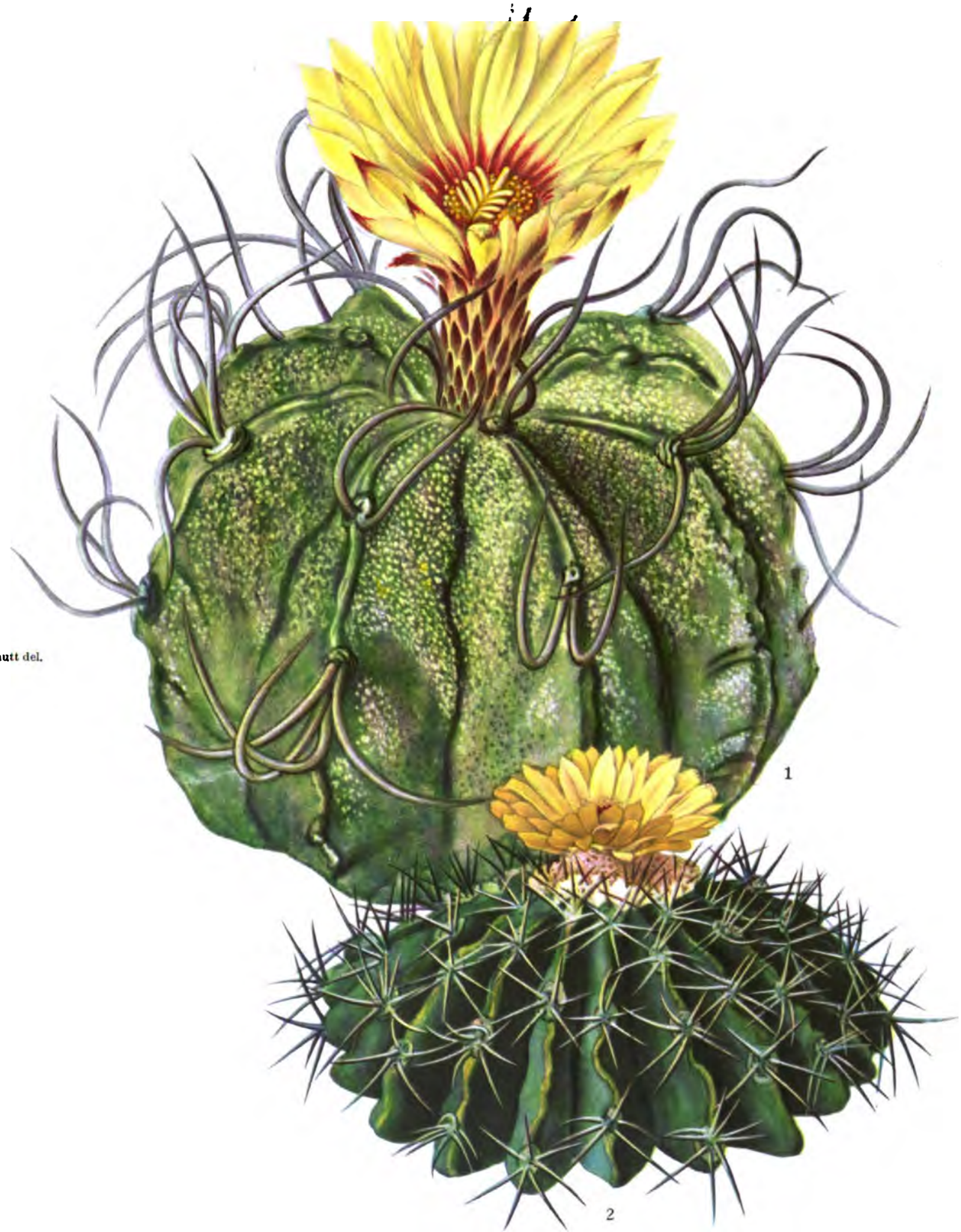
Cespitose, globose to short-columnar, green; ribs 20 or more, acute; spines 9 or 10, somewhat curved, slender, reddish when young, afterward silvery; flowers yellow, funnelform; scales of the ovary filled with hairs and bristles.

Type locality: Between Carepegua and Acaay, Paraguay.

Distribution: Paraguay.

We have had small plants of this species growing which do not differ very much, if any, from *Malacocarpus schumannianus.*

E. I. Schutt del.



M. E. Eaton del.

1. Flowering plant of *Astrophytum capricorne*.
2. Top of flowering plant of *Malacocarpus tephracanthus*.
(All natural size.)

A. Hoen & Co.

Echinocactus schumannianus nigrispinus Haage jr. (Monatsschr. Kakteenk. 9: 45. 1899) was given as a synonym of *E. nigrispinus*, but has never been published otherwise.

Illustrations: Weinberg, Cacti 11; Knippel, Kakteen pl. 9; Schelle, Handb. Kakteenk. 179. f. 112; Chodat, Veg. Paraguay 1: f. 90, as *Echinocactus nigrispinus*.

5. Malacocarpus reichei (Schumann).

Echinocactus reichei Schumann, Gesamtb. Kakteen Nachtr. 110. 1903.

Simple, globular, 6 to 7 cm. in diameter; ribs spiraled, broken into very regular tubercles; spines minute, appressed, 7 to 9, about equal; flowers small, light yellow, 2.5 cm. long or more; inner perianth-segments linear-oblong, acute; style slender, longer than the filaments, red; stigma-lobes red; ovary and tube with small scales, pilose and setose in the axils.

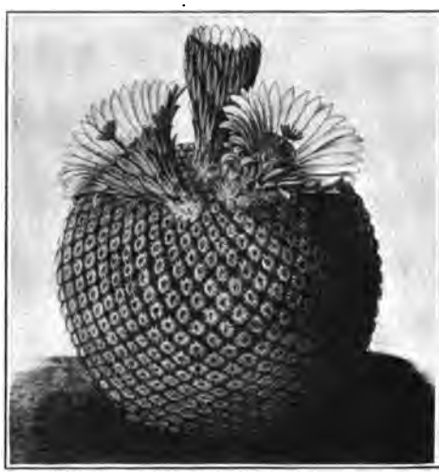


FIG. 202.—Malacocarpus reichei.

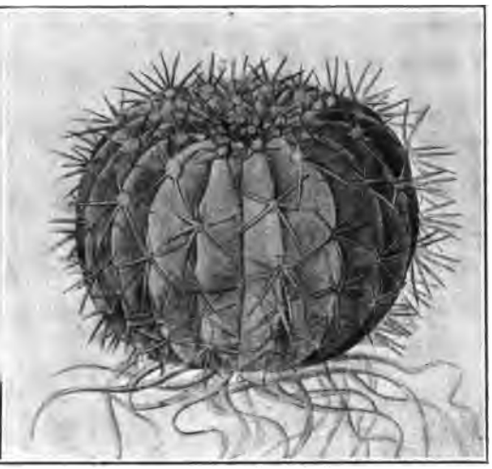


FIG. 203.—Malacocarpus tephracanthus.

Type locality: Not cited.

Distribution: Chile.

This species was sent from Santiago to Dr. Schumann by Dr. Karl Reiche in 1900 and does not seem to have been very much distributed. It is a very remarkable plant, judging from the illustration below cited, and may not be of this alliance. We know it only from description and illustration.

Illustration: Blühende Kakteen 1: pl. 42, as *Echinocactus reichei.*

Figure 202 is copied from the illustration cited above.

6. Malacocarpus napinus (Philippi).

Echinocactns napinus Philippi, Anal. Univ. Chile 41: 720. 1872.
Echinocactus mitis Philippi, Anal. Univ. Chile 85: 493. 1894.

Plant 2 to 9 cm. high with a very large root, larger than the globose stem itself; ribs broken into rounded tubercles; spines about 9, minute, 3 mm. long, appressed; flower small, about 3 cm. long, pale yellow to nearly white; flower-tube covered with minute scales, the axils long-woolly and bristly; stigma-lobes reddish.

Type locality: Huasco, Chile.

Distribution: Northern Chile.

Echinocactus napinus and *E. mitis* both came from Huasco, and Schumann is probably right in uniting them under the older name.

Illustrations: Monatsschr. Kakteenk. 11: 93, in part; Blühende Kakteen 2: pl. 77; Gartenflora 21: pl. 721, f. 1; Schumann, Gesamtb. Kakteen f. 69, A, as *Echinocactus napinus;* Schumann, Gesamtb. Kakteen f. 69, B, as *Echinocactus mitis.*

Figure 201 is copied from the third illustration cited above.

7. Malacocarpus apricus (Arechavaleta).

Echinocactus apricus Arechavaleta, Anal. Mus. Nac. Montevideo 5: 205. 1905.

Cespitose, in clusters of 2 to 10, subglobose, 3 to 5 cm. in diameter, umbilicate at apex, densely covered with interlocking spines; ribs 15 to 20, somewhat curved, more or less tuberculate; areoles orbicular, 3 to 4 mm. apart, tomentose when young, becoming naked in age; radial spines 18 to 20, grayish yellow, flexible; central spines several, 4 of the larger ones reddish at base; flowers yellow, 8 cm. long; flower-tube densely woolly and setose on the outside, very stout.

Type locality: Punta de la Ballena, Uruguay.

Distribution: Uruguay.

We know this plant only from description and illustration, from which the above description has been drawn.

Illustration: Anal. Mus. Nac. Montevideo 5: pl. 10, as *Echinocactus apricus*.

Figure 204 is copied from the illustration above cited.

FIG. 204.—Malacocarpus apricus.

FIG. 205.—Malacocarpus tabularis.

8. Malacocarpus concinnus (Monville).

Echinocactus concinnus Monville, Hort. Univ. 1: 222. 1839.
Echinocactus joadii Hooker in Curtis's Bot. Mag. 112: pl. 6867. 1886.
Echinocactus concinnus joadii Arechavaleta, Anal. Mus. Nac. Montevideo 5: 204. 1905.

Simple, globular or somewhat depressed, 5 to 7.5 cm. in diameter; ribs about 16 to 20, somewhat tuberculate, light green; young areoles white-felted; spines 10 to 12, spreading, setaceous; radial spines 5 to 7 mm. long; central spines 1 to 4, one much longer, spreading or turned downward; flowers large, 7 cm. long; outer perianth-segments narrow, acute, reddish; inner perianth-segments oblong, yellow, except the reddish tips, acute; stigma-lobes bright red; scales on the ovary hairy in their axils; perianth-tube slender.

Type locality: Not definitely cited.

Distribution: Southern Brazil and Uruguay.

We know this species only from description and illustrations.

Illustrations: Lemaire, Icon. Cact. pl. 6; Loudon, Encycl. Pl. ed. 3. 1376. f. 19366; Förster, Handb. Cact. ed. 2. 551. f. 70; Curtis's Bot. Mag. 70: pl. 4115; Pfeiffer, Abbild. Beschr. Cact. 2: pl. 11; Blühende Kakteen 2: pl. 94; Anal. Mus. Nac. Montevideo 5: pl. 9; Monatsschr. Kakteenk. 29: 141; Schelle, Handb. Kakteenk. 179. f. 113; 180. f. 114; Wiener Ill. Gart. Zeit. 29: f. 104; Rümpler, Sukkulenten 178. f. 97; Palmer, Cult. Cact. 129; De Laet, Cat. Gén. f. 8; Engler and Prantl, Pflanzenfam. 3^{6a}: f. 63; Watson, Cact. Cult. 94. f. 29; ed. 3. 50. f. 21, as *Echinocactus concinnus;* Curtis's Bot. Mag. 112: pl. 6867, as *Echinocactus joadii.*

9. Malacocarpus tabularis (Cels).

Echinocactus concinnus tabularis Cels in Förster, Handb. Cact. ed. 2. 552. 1885.
Echinocactus tabularis Cels in Schumann, Gesamtb. Kakteen 389. 1898.

Simple, globose or short-columnar; ribs 16 to 18, somewhat crenate, obtuse, glaucous; radial spines 16 to 18, acicular; central spines 4; flowers yellow, 6 cm. long; perianth-segments narrow, acute; scales of ovary bearing dense wool and long brown bristles in their axils; seeds hemispheric or dome-shaped with a broad truncate base, brownish, papillose-roughened, about 1 mm. broad.

Type locality: Not cited definitely.

Distribution: Brazil or Uruguay.

In the first two illustrations cited, the flowers are not shown as coming from the apex of the plant as one would expect.

The illustration given by Schumann (Gesamtb. Kakteen f. 66) suggests *Malacocarpus concinnus.*

Echinocactus tabularis cristatus Rebut seems to be only a garden form.

Illustrations: Blühende Kakteen 1: pl. 23; (?) Schumann, Gesamtb. Kakteen f. 66; Monatsschr. Kakteenk. 26: 57; 29: 141; Anal. Mus. Nac. Montevideo 5: pl. 6, as *Echinocactus tabularis.*

Figure 205 is copied from the first illustration cited above.

10. Malacocarpus scopa (Sprengel).

Cactus scopa Sprengel, Syst. 2: 494. 1825.*
Cereus scopa Salm-Dyck in De Candolle, Prodr. 3: 464. 1828.
Echinocactus scopa Link and Otto, Icon. Pl. Rar. 81. 1830.
Echinocactus scopa candidus Pfeiffer, Enum. Cact. 64. 1837.
Echinopsis scopa Carrière, Rev. Hort. 47: 374. 1875.
Echinocactus scopa albicans Arechavaleta, Anal. Mus. Nac. Montevideo 5: 199. 1905.

At first globular but becoming cylindric to clavate, 1 to 4.5 dm. high; ribs 30 to 40, low, obtuse, almost hidden by the spines; radial spines 40 or more, white, setaceous, spreading; central spines about 4, brown or purple, much stouter than the radials; flowers lemon-yellow, widely spreading and then 6 cm. broad; inner perianth-segments in 2 series, spatulate, somewhat toothed above; stigma-lobes about 10, bright red; scales on the ovary bearing wool and conspicuous brown bristles.

Type locality: Not cited.

Distribution: Southern Brazil and Uruguay.

Echinocactus scopa candidus cristatus, E. scopa cristatus Hortus, *E. scopa ruberrimus,* and *E. scopa rubrinus* Link and Otto may or may not be published varietal names.

Illustrations: Cact. Journ. 1: 57; Gartenwelt 15: 539; Watson, Cact. Cult. 119. f. 45, as *Echinocactus scopa cristatus;* Cact. Journ. 1: 67; Gartenwelt 9: 267; Schelle, Handb. Kakteenk. 176. f. 107; 177. f. 109, as *E. scopa candidus cristatus;* Anal. Mus. Nac. Montevideo 5: pl. 8, as *E. scopa albicans;* Möllers Deutsche Gärt. Zeit. 25: 474. f. 6, No. 13; Schelle, Handb. Kakteenk. 175. f. 106, as *E. scopa candidus;* Rev. Hort. 47: 374. f. 60, as *Echinopsis*

*We have credited the name, *Cactus scopa,* to Sprengel, as above. He marks it with an asterisk (*) as he does all his new names. The usual citation is to Link (Enum. Hort. Berol. 2: 21. 1822) who in the place cited does list a number of species of *Cactus* but not *C. scopa.* It is remarkable how general this error has become for we find it in De Candolle (Prodr. 3: 464. 1828), Pfeiffer (Enum. Cact. 64. 1837), Förster (Handb. Cact. 304. 1846), Labouret (Monogr. Cact. 238. 1853), Hooker (Curtis's Bot. Mag. 90: pl. 5445), Schumann (Gesamtb. Kakteen 381. 1898), the Index Kewensis, and elsewhere.

scopa; Rev. Hort. **47**: 375. f. 61; Rümpler, Sukkulenten 181. f. 100; Förster, Handb. Cact. ed. 2. 137. f. 7; Dict. Gard. Nicholson **4**: 540. f. 24; Suppl. 336. f. 360 (these last five illustrations are the same, and are sometimes called *Echinopsis scopa candida cristata, Echinocactus scopa candidus, E. scopa candidus cristatus,* and *E. scopa cristatus);* Loudon, Encycl. Pl. ed. 3. 1378. f. 19383; Curtis's Bot. Mag. **90**: pl. 5445; Edwards's Bot. Reg. **25**: pl. 24; Förster, Handb. Cact. ed. 2. 136. f. 6; Anal. Mus. Nac. Montevideo **5**: pl. 7; Blühende Kakteen **3**: pl. 155; Abh. Bayer, Akad. Wiss. München **2**: pl. 1, sec. 3, f. 5; Link and Otto, Icon. Pl. Rar. pl. 41; Rümpler, Sukkulenten f. 99; Gartenflora 56: 20. f. 5; Watson, Cact. Cult. 118. f. 44; ed. 3. 59. f. 28, as *Echinocactus scopa.*

11. Malacocarpus pulcherrimus (Arechavaleta).

Echinocactus pulcherrimus Arechavaleta, Anal. Mus. Nac. Montevideo **5**: 222. 1905.

Small, 3 to 5 cm. high, 1.5 to 2 cm. in diameter; ribs 19 to 21, low and broad, tuberculate; radial spines 10 to 12, acicular, white, 1 to 2 mm. long; flowers 1.5 to 2 cm. long, 2.5 to 3 cm. broad, yellow; perianth-segments oblong, acute, sometimes mucronate; ovary and flower-tube densely white-woolly and setose; fruit turbinate, 1 cm. long, fleshy.

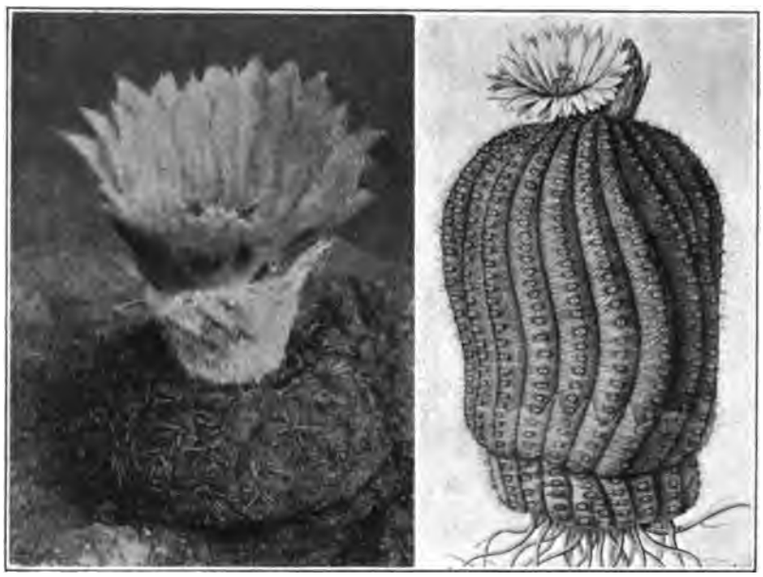


FIG. 206.—Malacocarpus pulcherrimus. FIG. 207.—Malacocarpus muricatus.

Type locality: Paso de los Toros.
Distribution: Uruguay, but known only from the type collection.
We know this little plant from the original description and illustration only.
Illustration: Anal. Mus. Nac. Montevideo **5**: pl. 16, as *Echinocactus pulcherrimus.*
Figure 206 is copied from the illustration above cited.

12. Malacocarpus muricatus (Otto).

Echinocactus muricatus Otto in Pfeiffer, Enum. Cact. 49. 1837.

Simple or sometimes proliferous, either globular or columnar, said to be depressed at apex, 2 dm. in diameter; ribs 16 to 20, obtuse, crenate, dull, glaucous; radial spines 15 to 20, white, setaceous, 8 mm. long; central spines 3 or 4, brown at tips, 13 mm. long; areoles approximate; flowers 3 cm. long, yellow; inner perianth-segments acute; style longer than the stamens; stigma-lobes 7 to 9, purple; scales of the ovary with their axils filled with wool and bristles.

Type locality: Brazil.
Distribution: Southern Brazil.

We know this species from description and illustration only.

Illustration: Martius, Fl. Bras. 4^2: pl. 50, f. 2, as *Echinocactus muricatus.*

Figure 207 is copied from the illustration above cited.

13. Malacocarpus linkii (Lehmann).

Cactus linkii Lehmann, Ind. Sem. Hamburg 16. 1827.
Echinocactus linkii Pfeiffer, Enum. Cact. 48. 1837.

Oval to short-cylindric, 7 to 15 cm. high; ribs 13, obtuse; areoles somewhat sunken into the ribs, 8 mm. apart; spines weak, spreading; radial spines 10 to 12, white with brownish tips; central spines 3 or 4, brownish; flowers yellow, 2.5 cm. long, 5 cm. broad when fully expanded; inner perianth-segments broad, obtuse; scales of the ovary woolly and setose in their axils; stigma-lobes red.

FIG. 208.—Malacocarpus linkii.

FIG. 209.—Malacocarpus ottonis.

Type locality: Cited as Mexico, but in error.

Distribution: Southern Brazil.

This species must be close to *Malacocarpus ottonis* and the two are often confused. The original illustrations are so different, however, that we believe they must be distinct.

Echinocactus linkii spinosior (Förster, Handb. Cact. 301. 1846) is only a name.

The name *Cereus linkii* Lehmann appears in Pfeiffer's Enumeratio (48. 1837) as a synonym of *Echinocactus linkii*, but it does not occur thus where he cites it (Nov. Act. Nat. Cur. 16: 316. 1828) but as *Cactus (Cereus) linkii.*

Illustration: Nov. Act. Nat. Cur. 16: pl. 14, as *Cactus linkii.*

Figure 208 is copied from the illustration cited above.

14. Malacocarpus ottonis (Lehmann).

Cactus ottonis Lehmann, Ind. Sem. Hamburg 16. 1827.
Echinocactus tenuispinus Link and Otto, Verh. Ver. Beförd. Gartenb. 3: 421. 1827.
Echinocactus tenuispinus minor Link and Otto, Verh. Ver. Beförd. Gartenb. 3: 422. 1827.
Echinocactus tortuosus Link and Otto, Icon. Pl. Rar. 29. 1829.
Echinocactus ottonis Link and Otto, Icon. Pl. Rar. 31. 1830.
Opuntia ottonis G. Don, Hist. Dichl. Pl. 3: 172. 1834.
Echinocactus ottonis tenuispinus Pfeiffer, Enum. Cact. 48. 1837.
Echinocactus ottonis pallidior Monville in Lemaire, Cact. Gen. Nov. Sp. 88. 1839.
Echinocactus ottonis spinosior Monville in Lemaire, Cact. Gen. Nov. Sp. 88. 1839.
Echinocactus ottonis tortuosus Schumann, Gesamtb. Kakteen 392. 1898.

Echinocactus ottonis paraguayensis Heese, Gartenwelt 9: 266. 1905.
Echinocactus ottonis uruguayus Arechavaleta, Anal. Mus. Nac. Montevideo 5: 213. 1905.
Echinocactus arechavaletai Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 496. 1905.
Echinocactus spegazzinii Gürke, Monatsschr. Kakteenk. 15: 110. 1905.
Echinocactus ottonis brasiliensis Haage jr., Monatsschr. Kakteenk. 24: 41. 1914.

Simple or cespitose, globular or somewhat depressed, more or less glossy green, 5 to 6 cm. in diameter; ribs 10, broad and rounded below; areoles few, usually distant, 1 cm. apart or more, small, circular; spines acicular, brown, 1 cm. long or less; flowers from the uppermost areoles, one or more appearing at a time, 5 to 6 cm. long, bright yellow; perianth-segments linear-oblong, acute; stamens about half the length of the perianth-segments; style yellow; stigma-lobes red; axils of scales filled with long brown wool and brown bristles.

Type locality: Supposed to be Mexico, but the species was described from a garden plant.
Distribution: Southern Brazil, Uruguay, and adjacent parts of Argentina.

The varietal name, *Echinocactus ottonis paraguayensis*, is usually credited to Schumann who used it in 1900 (Monatsschr. Kakteenk. 10: 179). The name *Cereus ottonis* appears in Pfeiffer's Enumeratio (47. 1837) as a synonym of *Echinocactus ottonis*, but it does not occur thus where Pfeiffer cites it (Nov. Act. Nat. Cur. 16: 316. 1828), but as *Cactus (Cereus) ottonis*.

The following varieties are sometimes met with: *E. ottonis brasiliensis* (Monatsschr. Kakteenk. 18: 48. 1908), *pfeifferi* Monville (Salm-

FIGS. 210 and 211.—Malacocarpus ottonis.

Dyck, Cact. Hort. Dyck. 1844. 19. 1845), and *minor* (Förster, Handb. Cact. 302. 1846), and *Echinocactus muricatus hortatani* (Labouret, Monogr. Cact. 232. 1853).

A hybrid has been produced with this species and a plant called *Echinopsis zuccarinii*.

Illustrations: Cact. Journ. 1: 43, 54; Monatsschr. Kakteenk. 12: 158; 29: 125; Martius, Fl. Bras. 4^2: pl. 51, f. 3; Edwards's Bot. Reg. 24: pl. 42; Rev. Hort. 1861: 270. f. 62; Curtis's Bot. Mag. 58: pl. 3107; Link and Otto, Icon. Pl. Rar. pl. 16; De Laet, Cat. Gén. f. 11; Möllers Deutsche Gärt. Zeit. 25: 474. f. 6, No. 17; Rümpler, Sukkulenten 179. f. 98, as *Echinocactus ottonis;* Anal. Mus. Nac. Montevideo 5: pl. 12; De Laet, Cat. Gén. f. 4; Tribune Hort. 4: pl. 140, as *Echinocactus ottonis tenuispinus;* Link and Otto, Icon. Pl. Rar. pl. 15, as *E. tortuosus;* Nov. Act. Nat. Cur. 16: pl. 15, as *Cactus ottonis;* Verh. Ver. Beförd. 3: pl. 19, f. 1, 2, as *Melocactus tenuispinus;* Anal. Mus. Nac. Montevideo 5: pl. 13, as *E. ottonis uruguayus;* Gartenwelt 9: 267; Schelle, Handb. Kakteenk. 182. f. 116, as *Echinocactus ottonis paraguayensis;* Anal. Mus. Nac. Montevideo 5: pl. 11, as *Echinocactus arechavaletai;* Curtis's Bot. Mag. 68: pl. 3963, as *Echinocactus tenuispinus;* Dict. Hort. Bois 465. f. 323, as *Echinocactus tenuispinus ottonis;* Karsten, Deutsche Fl. 887. f. 501, No. 12; ed. 2. 2: 456. f. 605, No. 12, as *Echinocactus tenuissimus*.

Plate XX, figure 2, shows the plant obtained by Dr. Rose from W. Mundt, in 1912, which has since flowered repeatedly in the New York Botanical Garden; plate XXIII, figure 2, shows a plant obtained by Dr. Shafer at Concordia, Argentina, in 1917 (No. 118) which afterwards flowered in the New York Botanical Garden. Figure 209 is copied from the illustration of Link and Otto, cited above as *Cactus ottonis;* figure 210 is from a photograph furnished by Dr. Spegazzini of a plant cultivated by him as *Echinocactus arechavaletai;* figure 211 shows a plant collected by Dr. Shafer at Concordia, Argentina, in 1917 (No. 118).

15. Malacocarpus catamarcensis (Spegazzini).

Echinocactus catamarcensis Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 500. 1905.
Echinocactus catamarcensis pallidus Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 500. 1905.
Echinocactus catamarcensis obscurus Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 501. 1905.

Simple, elliptic to short-cylindric, 10 to 50 cm. high, 8 to 12 cm. in diameter, grayish green; ribs 11 to 13, obtuse, tuberculate; spines terete, more or less erect, grayish with brown tips, subulate, slightly curved; radial spines 14 to 21, 10 to 20 mm. long; central spines 4 to 7, 25 to 30 mm. long; flowers 4.5 cm. long, citron to golden; stigma-lobes yellowish; scales of the ovary filled with wool and bristles.

Type locality: Argentina.
Distribution: Western Argentina.

FIG. 212.—Malacocarpus catamarcensis.

FIG. 213.—Malacocarpus patagonicus.

We know this species chiefly from the original description and photograph obtained by Dr. Rose in 1915 from Dr. Spegazzini. To it we have referred a living plant collected by Dr. Aleš Hrdlička in Argentina in 1910, which has flowered with us on one or two occasions.

Figure 212 is from a photograph of the plant collected by Aleš Hrdlička.

16. Malacocarpus patagonicus (Weber).

Echinocactus intertextus Philippi, Linnaea 33: 81. 1864. Not Engelmann, 1856.
Cereus patagonicus Weber in Spegazzini, Rev. Agron. La Plata 3: 604. 1897.
Echinocactus coxii Schumann, Gesamtb. Kakteen 422. 1898.
Cereus duseni Weber, Anal. Soc. Cient. Argentina 48: 49. 1899.

Usually simple and erect, slender, cylindric, 6 dm. long or less, 3 to 5 dm. in diameter, very spiny, green or somewhat glaucous-green; ribs 6 to 10, straight or spiraled, somewhat undulate; areoles approximate; radial spines 6 to 10, spreading; central spines 1 to 3, much stouter, subulate, some of them sometimes more or less hooked; flowers from near the top of plant, 3.5 cm. long, fully as broad when expanded, inodorous; inner perianth-segments pale rose-colored, spatulate, 18 mm. long, 8 mm. broad, mucronate; fruit about 2 cm. long, greenish; style thick, 15 mm. long; stigma-lobes black-purple; ovary turbinate, 8 mm. in diameter, the axils of its scales woolly and bristly; seeds 2.5 mm. broad.

Type locality: Chubut, Argentina.

Distribution: Southern Argentina.

This species has been very confusing not only as to its identification, but as to its generic relationship. It is possible that more than one species has been treated here. The plant grows in barren regions, often among boulders where there is no other vegetation.

Figure 213 is from a photograph taken by Mr. Walter Fischer at General Roca, Rio Negro, showing how the plant grows in its natural surroundings; figure 214, showing a potted plant, and figure 215, the top of a flowering plant, are from photographs contributed by Mr. C. Bruch.

FIGS. 214 and 215.—Malacocarpus patagonicus.

17. Malacocarpus erinaceus (Haworth) Rümpler in Förster, Handb. Cact. ed. 2. 455. 1885.

Cactus erinaceus Haworth, Pl. Succ. Suppl. 74. 1819.
Echinocactus poliacanthus Link and Otto, Verh. Ver. Beförd. Gartenb. 3: 422. 1827.
Melocactus poliacanthus Link and Otto, Verh. Ver. Beförd. Gartenb. 3: pl. 16, f. 1. 1827.
Echinocactus corynodes Otto in Pfeiffer, Enum. Cact. 55. 1837.
Echinocactus erinaceus Lemaire, Cact. Aliq. Nov. 16. 1838.
Malacocarpus corynodes Salm-Dyck, Cact. Hort. Dyck. 1849. 25. 1850.
Malacocarpus corynodes erinaceus Salm-Dyck, Cact. Hort. Dyck. 1849. 25. 1850.
Malacocarpus polyacanthus Salm-Dyck, Cact. Hort. Dyck. 1849. 25. 1850.
Malacocarpus acuatus Salm-Dyck, Cact. Hort. Dyck. 1849. 25. 1850.
Echinocactus corynodes erinaceus Labouret, Monogr. Cact. 170. 1853.
Echinocactus acuatus corynodes Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 494. 1905.
Echinocactus acuatus depressus Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 494. 1905.
Echinocactus acuatus erinaceus Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 495. 1905.
Echinocactus leucocarpus Arechavaleta, Anal. Mus. Nac. Montevideo 5: 239. 1905.

Simple, globular to short-cylindric, 15 cm. high, very woolly at top, up to 15 cm. high; ribs 15 to 20, obtuse, strongly undulate; areoles borne in the depressions on ribs, felted when young; radial spines 6 to 8, subulate, yellowish, 1 to 2 cm. long; central spine solitary; flowers yellow, 4 to 5 cm. long, 7 cm. broad when fully open; inner perianth-segments spreading, oblong to spatulate, acute, often serrate above; stigma-lobes bright red.

Type locality: Not cited.

Distribution: Southern Brazil and adjacent parts of Argentina and Uruguay.

Schumann was inclined to refer here *Echinocactus aciculatus* Salm-Dyck (Hort. Dyck. 341. 1834; *Malacocarpus aciculatus* Salm-Dyck, Cact. Hort. Dyck. 1849. 25. 1850) and

Echinocactus terscheckii Reichenbach (Terscheck, Suppl. 3; also Walpers, Repert. Bot. 2: 315. 1843).

Echinocactus rosaceus (Otto, Allg. Gartenz. 1: 364. 1833), *E. acutangulus* Zuccarini (Pfeiffer, Enum. Cact. 55. 1837), and *E. conquades* (Förster, Handb. Cact. 338. 1846) have usually been referred to *Echinocactus corynodes* but were never described.

Echinocactus erinaceus elatior Monville (Salm-Dyck, Cact. Hort. Dyck. 1844. 22. 1845), without description, must be referred here.

Illustrations: Schumann, Gesamtb. Kakteen f. 50; Schelle, Handb. Kakteenk. f. 69; De Laet, Cat. Gén. f. 21, as *Echinocactus erinaceus;* Verh. Ver. Beförd. Gartenb. 3: pl. 16, f. 1, as *Melocactus poliacanthus;* Abh. Bayer. Akad. Wiss. München 2: pl. 1, sec. 3, f. 1 to 4; Curtis's Bot. Mag. 68: pl. 3906; Anal. Mus. Nac. Montevideo 5: pl. 22, as *Echinocactus corynodes;* Monatsschr. Kakteenk. 4: 141; Förster, Handb. Cact. ed. 2. f. 52; Rümpler, Sukkulenten 174. f. 96; Garten-Zeitung 4: 182. f. 42, No. 18; Krook, Handb. Cact. 67, as *Malacocarpus corynodes;* Gartenflora 31: 216, as *Malacocarpus corynodes erinaceus;* Anal. Mus. Nac. Montevideo 5: pl. 23, as *Echinocactus leucocarpus;* Deutsche Gärt. Zeit. 7: 312; Dict. Gard. Nicholson 2: 317. f. 504; Monatsschr. Kakteenk. 4: 141; Förster, Handb. Cact. ed. 2. 455. f. 53.

Figure 216 is copied from plate 3906 of Curtis's Botanical Magazine, cited above.

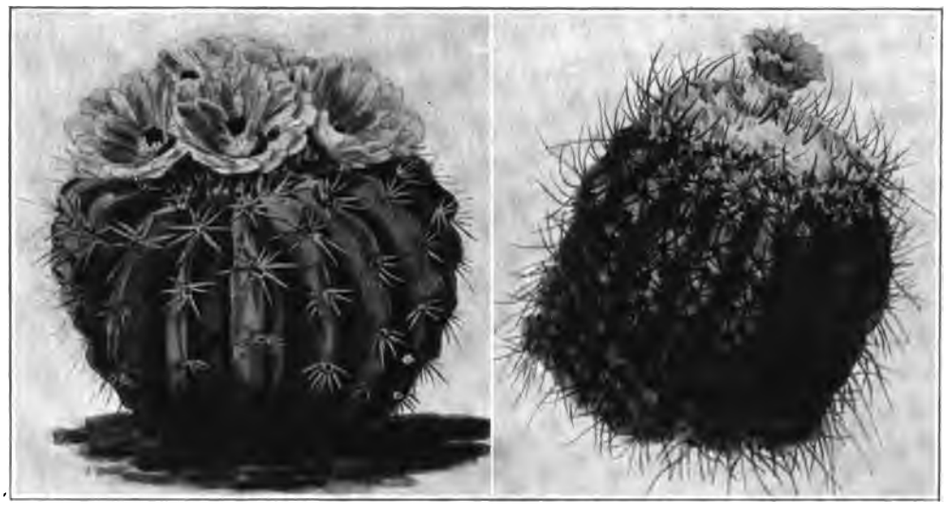


FIG. 216.—Malacocarpus erinaceus.

FIG. 217.—Malacocarpus langsdorfii.

18. Malacocarpus langsdorfii (Lehmann).

Cactus langsdorfii Lehmann, Ind. Sem. Hamburg 17. 1826.
Melocactus langsdorfii De Candolle, Prodr. 3: 461. 1828.
Echinocactus langsdorfii Link and Otto, Icon. Pl. Rar. 79. 1830.

Oblong, 10 cm. high or more, very woolly at apex; ribs 17, obtuse, strongly tubercled; radial spines about 6, more or less unequal, somewhat spreading; central spine usually solitary, 2.5 cm. long; flower yellow, 1.5 cm. broad, campanulate; inner perianth-segments oblong, obtuse, about 20; filaments yellow; stigma-lobes numerous, purple.

Type locality: Central Brazil.

Distribution: Central and southern Brazil.

This plant was first described in the Seed Catalogue of the Botanical Garden of Hamburg. The next year Lehmann published two descriptions of it under the name of *Cactus* (*Echinocactus*) *langsdorfii*, one of which was accompanied by a colored illustration (see second illustration cited above). We have seen no living plants or other illustrations which we are disposed to refer here and we have therefore kept the species distinct,

although we are aware that Schumann refers it first to *Malacocarpus polyacanthus* and afterwards to *Echinocactus erinaceus*.

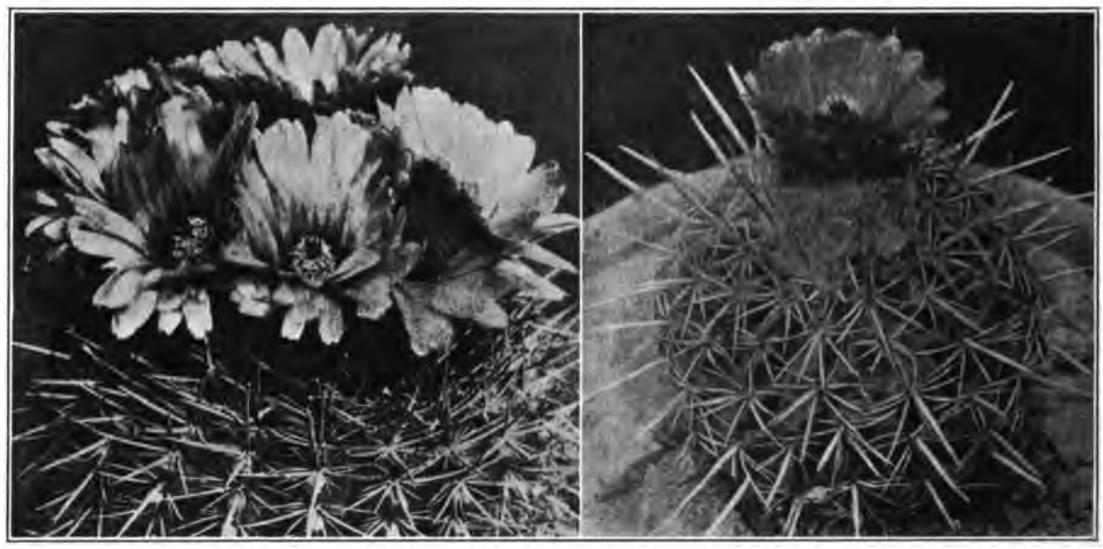
Illustrations: Link and Otto, Icon. Pl. Rar. pl. 40, as *Echinocactus langsdorfii;* Nov. Act. Nat. Cur. **16**: pl. 13, as *Cactus langsdorfii*.

Figure 217 is copied from the second illustration cited above.

19. Malacocarpus mammulosus (Lemaire).

Echinocactus mammulosus Lemaire, Cact. Aliq. Nov. 40. 1838.
Echinocactus hypocrateriformis Otto and Dietrich, Allg. Gartenz. **6**: 169. 1838.
Echinocactus submammulosus Lemaire, Cact. Gen. Nov. Sp. 20. 1839.
Echinocactus pampeanus Spegazzini, Contr. Fl. Vent. 27. 1896.
Echinocactus acuatus arechavaletai Spegazzini, Anal. Mus. Nac. Buenos Aires III. **4**: 494. 1905.
Echinocactus mammulosus submammulosus Spegazzini, Anal. Mus. Nac. Buenos Aires III. **4**: 496. 1905.
Echinocactus mammulosus pampeanus Spegazzini, Anal. Mus. Nac. Buenos Aires III. **4**: 496. 1905.
Echinocactus mammulosus hircinus Spegazzini, Anal. Mus. Nac. Buenos Aires III. **4**: 496. 1905.
Echinocactus mammulosus typicus Spegazzini, Anal. Mus. Nac. Buenos Aires III. **4**: 496. 1905.
Echinocactus floricomus Arechavaleta, Anal. Mus. Nac. Montevideo **5**: 183. 1905.
Echinocactus pampeanus charruanus Arechavaleta, Anal. Mus. Nac. Montevideo **5**: 193. 1905.
Echinocactus pampeanus rubellianus Arechavaleta, Anal. Mus. Nac. Montevideo **5**: 194. 1905.
Echinocactus pampeanus subplanus Arechavaleta, Anal. Mus. Nac. Montevideo **5**: 194. 1905.
Echinocactus arechavaletai Schumann in Arechavaleta, Anal. Mus. Nac. Montevideo **5**: 208. 1905. Not Spegazzini, Jan. 1905.

Simple, nearly globose, about 8 cm. high, light shining green; ribs 18 to 25, strongly tuberculate, almost covered by the numerous interlocking spines; radial spines 20 to 30, 5 cm. long; central spines 2 to 4, about 2 cm. long; flowers yellow, 3.5 to 4 cm. long; scales of the ovary woolly and setose in their axils.



FIGS. 218 and 219.—Malacocarpus mammulosus.

Type locality: Not cited.

Distribution: Brazil, Uruguay, and Argentina.

Labouret (Monogr. Cact. 228, 229. 1853) mentioned three varieties of this species as follows: *spinosior* Haage, *cristatus* Monville, and *minor* Monville.

Echinocactus hypocrateriformis spinosior Haage probably should be referred here.

Spegazzini (Anal. Mus. Nac. Buenos Aires III. **4**: 496. 1905) referred the species *pampeanus* and *submammulosus* as varieties of this species.

Illustrations: Schelle, Handb. Kakteenk. 181. f. 115; Knippel, Kakteen pl. 9; Cact. Journ. **2**: 102; Anal. Mus. Nac. Montevideo **5**: pl. 3, as *Echinocactus mammulosus;* Martius, Fl. Bras. **4**[2]: pl. 51, f. 2, as *Echinocactus hypocrateriformis;* Anal. Mus. Nac. Montevideo **5**:

pl. 2, as *Echinocactus floricomus;* Anal. Mus. Nac. Montevideo 5: pl. 5, as *Echinocactus pampeanus;* Anal. Mus. Nac. Montevideo 5: pl. 24; Monatsschr. Kakteenk. 15: 107, as *Echinocactus arechavaletai;* Monatsschr. Kakteenk. 27: 18; 29: 141; Anal. Mus. Nac. Montevideo 5: pl. 4, as *Echinocactus submammulosus.*

Plate XXII, figure 1, shows a plant collected by Dr. Shafer near Salto, Uruguay, in 1917 (No. 124) which has flowered repeatedly in the New York Botanical Garden. Figure 218 is copied from Arechavaleta's illustration of *Echinocactus floricomus* cited above; figure 219 is copied from Arechavaleta's illustration of *Echinocactus arechavaletai* cited above.

20. Malacocarpus islayensis (Förster).

Echinocactus islayensis Förster, Hamb. Gartenz. 17: 160. 1861.
*Echinocactus molendensis** Vaupel, Bot. Jahrb. Engler 50: Beibl. 111: 24. 1913.

Simple, 5 to 7 cm. in diameter, almost entirely hidden under a mass of spines, woolly at the apex; ribs numerous, 19 to 25, low and obtuse; areoles approximate, 2 to 4 mm. apart, brown-felted when young; radial spines 8 to 22, spreading, 1 to 10 mm. long; central spines 4 to 7, stouter than the radials, straight, 12 to 16 mm. long, grayish to horn-colored; flowers small, 1.5 to 2 cm. long, yellow; outer perianth-segments reddish; scales on ovary and flower-tube bearing in their axils long hairs and long reddish bristles.

Type locality: Province of Islay, southern Peru.
Distribution: Southern Peru.

In 1914, while traveling in Peru, Dr. Rose made a special trip to Mollendo to re-collect *Echinocactus molendensis* which he found quite common on the hills above the town (Rose, No. 18999). A careful study of this material, some of which was sent home alive, leads us to believe that it is the same as *Echinocactus islayensis.*

Plate XXII, figure 4, is from a plant collected by Dr. Rose near Mollendo, Peru, in 1914.

21. Malacocarpus strausianus (Schumann).

Echinocactus strausianus Schumann, Monatsschr. Kakteenk. 11: 112. 1901.

Globular to short-cylindric, dull grayish green, up to 16 cm. high, very spiny; ribs about 13, more or less tuberculate, obtuse; spines 9 to 20, subulate, the longest 3 cm. long, reddish brown; central spines 1 to several; flower 1.5 cm. long, opening for at least 2 days, closing at night; outer perianth-segments brownish, 2.5 cm. long; inner perianth-segments about 20, linear-oblong, acute, deep salmon; filaments erect; style white; stigma-lobes linear, cream-colored; scales on ovary and flower-tube white-woolly and bristly in their axils.

Type locality: Argentina.
Distribution: Western Argentina.

This species is common about Mendoza, Argentina; specimens sent from there by Dr. Rose in 1915 (No. 21019) first flowered in the New York Botanical Garden in May 1917. It is named for Kaufmann Straus.

Illustrations: Monatsschr. Kakteenk. 11: 107; Schumann, Gesamtb. Kakteen Nachtr. f. 16, as *Echinocactus strausianus.*

22. Malacocarpus haselbergii (F. Haage).

Echinocactus haselbergii F. Haage in Förster, Handb. Cact. ed. 2. 563. 1885.

Simple, bright green, globose or somewhat depressed, 7 to 8 cm. in diameter; ribs 30 or more, somewhat tuberculate, more or less spiraled; radial spines about 20, acicular, white, almost bristle-like, 1 cm. long; central spines 3 to 5, pale yellow; flowers small, 2.5 to 3 cm. broad, red without, variegated within; flower-tube very short or none; stamens yellow, included; stigma-lobes 6, erect; scales of ovary small, woolly, and setose in their axils.

Type locality: Not cited in original description, but afterwards said to be the state of Rio Grande do Sul, Brazil.

*This species was named for the town, Mollendo, and, therefore, should have been spelled with two l's.

Distribution: Southern Brazil.

There is much uncertainty regarding the limitations of this species and also regarding its generic disposal. It was first described incidentally by Rümpler who considered it a bare form of *Echinocactus scopa*. Hooker, a few years after Rümpler, described and figured it and expressed his belief that it was a distinct species, well separated from *E. scopa*. Later on, it was described and illustrated by Gürke; the flower is shown with a slender elongated tube which is very unlike the flower illustrated by Hooker. Whether we have a plant with a very variable flower or two distinct species we can not determine without further field study.

Dr. Rose saw a plant in the Berlin Botanical Garden in 1912, just after it flowered, which he believed then was a generic type. He noted that the ovary was covered with clusters of spines as in the species of *Echinocereus*. It was first supposed to be a form of *Echinocactus scopa*, under which species it was incidentally first described. Hooker, when he described and illustrated it, stated that while it belonged to the same section of the genus it differed from it in the form of the plant and in the perianth. He placed it in Salm-Dyck's section, *Microgoni*.

This plant was named for Dr. von Haselberg of Stralsind, a cultivator of cacti. The variety *cristatus* is in the trade.

Illustrations: Curtis's Bot. Mag. **114**: pl. 7009; Blühende Kakteen **2**: pl. 98; Schelle, Handb. Kakteenk. 176. f. 108; Monatsschr. Kakteenk. **26**: 171; Tribune Hort. **4**: pl. 139; De Laet, Cat. Gén. f. 1; Möllers Deutsche Gärt. Zeit. **25**: 474. f. 6, No. 6, as *Echinocactus haselbergii*.

23. Malacocarpus maassii (Heese).

Echinocactus maassii Heese, Gartenflora **56**: 410. 1907.

Globular to short-cylindric, 10 to 15 cm. in diameter, yellowish green; ribs 13, spiraled, prominent near the apex, almost wanting at base, somewhat undulate or tubercled; radial spines 8 to 10, white, long, and weak, or sometimes 1 or 2 stouter; central spine 4 to 7 cm. long, much stouter than the radials, much curved and often hooked; flowers 14 cm. broad, orange-red; segments numerous, linear-oblong, 10 mm. long; filaments yellow; style stout, white; stigma-lobes yellow; ovary long and densely soft-woolly; fruit 5 to 6 cm. in diameter, dry, dehiscing by abscission above the base; umbilicus broad, circular; scales on the ovary minute, their axils filled with long white hairs; seeds black, globular, 2 mm. in diameter, tuberculate-roughened, with a prominent white aril at base.

Type locality: Bolivia.

Distribution: Southern Bolivia and northern Argentina.

The original description and illustration are poor. We believe, however, that this is the plant collected by J. A. Shafer in crevices of rocks, altitude 3,450 meters, at La Quiaca, Jujuy, Argentina, February 13, 1917 (No. 81). Our description is drawn entirely from Dr. Shafer's plant.

Illustrations: Gartenflora **56**: 410. f. 50; Monatsschr. Kakteenk. **25**: 45, as *Echinocactus maassii*.

24. Malacocarpus tuberisulcatus (Jacobi).

Cactus horridus Colla, Mem. Accad. Sci. Torino **37**: 76. 1833. Not Humboldt, Bonpland, and Kunth, 1823.
Echinocactus horridus Remy in Gay, Fl. Chilena **3**: 15. 1847.
Echinocactus tuberisulcatus Jacobi, Allg. Gartenz. **24**: 108. 1856.
Echinocactus soehrensii Schumann, Monatsschr. Kakteenk. **11**: 75. 1901.

Simple or sometimes in clusters of 9 or fewer, globular, often 2 dm. in diameter, dull green, depressed at apex; ribs 14 to 20, prominent, obtuse, strongly tubercled, separated by narrow intervals; tubercles with a flattened acute chin; areoles at first small, spineless, with an abundance of white wool but when old large, sometimes 1.5 cm. in diameter; radial spines not all developing the first year, brown when young, dark gray in age; radial spines 10 to 12; central spines 4 or 5, similar to the radials but a little stouter and longer, at most 2.5 cm. long; flowers 4.5 cm. long, yellowish, their areoles described as sparingly woolly.

M. E. Eaton del.

1. Top of flowering plant of *Malacocarpus mammulosus*.
2. Fruiting plant of *Mila caespitosa*.
3. Flowering plant of *Astrophytum myriostigma*.
4. Fruiting plant of *Malacocarpus islayensis*.

(All natural size.)

A Hoen & Co

Type locality: Stony hillslopes near Valparaiso, Chile.

Distribution: Along the coastal hills of central Chile.

Dr. Rose found this plant very common in two localities in central Chile. One was in pasture on the hills above Valparaiso, altitude about 1,000 feet; the other was on the edge of cliffs about Valparaiso Harbor and only about 20 feet above the water. In the latter locality it was associated with *Neoporteria subgibbosa.*

Under *Echinocactus soehrensii,* Haage and Schmidt (1920) offer for sale the varieties *albispinus, brevispinus,* and *niger.*

Cactus horridus Colla, *Echinocactus tuberisulcatus* Jacobi, and *E. soehrensii* were all based upon plants from Valparaiso and we believe we are justified in combining them under the oldest specific name available.

Illustrations: Mem. Accad. Sci. Torino 37[1]: pl. 17, f. 1, as *Cactus horridus;* Schumann, Gesamtb. Kakteen Nachtr. f. 25; Monatsschr. Kakteenk. 11: 73, as *Echinocactus soehrensii.*

25. Malacocarpus curvispinus (Bertero).

Cactus curvispinus Bertero, Merc. Chil. 598. No. 13. 1829; Colla, Mem. Accad. Sci. Torino 37: 76. 1833.
Echinocactus curvispinus Remy in Gay, Fl. Chilena 3: 16. 1847.
Echinocactus froehlichianus Schumann, Gesamtb. Kakteen Nachtr. 124. 1903.

Simple or clustered, subglobose or short-columnar, 15 cm. high, pale green; ribs 16, broad and obtuse, divided into large tubercles; spines 15, all radials, or at least no very definite central ones, straight or somewhat curved, flexuous; flowers yellow or reddish brown, large, 3 to 6.5 cm. long; perianth-segments lanceolate, acute; stigma-lobes green; scales on the flower-tube and ovary small, scattered, bearing short wool and setae in their axils.

Type locality: Chile.

Distribution: Chile.

Mr. Söhrens tells us that he obtained the specimens, which were named *Echinocactus froehlichianus,* from the mountains south of Santiago and that he now considers the species the same as *Echinocactus curvispinus.*

Bertero's type of *Cactus curvispinus* is preserved in the museum at Santiago. It consists of one small fragment bearing two clusters of spines and one flower; the spine-cluster contains 10 or 11 spines, the longest of which is 2 cm. long; the flower is 3 cm. long with the ovary bearing small scales with woolly axils and the uppermost scales bearing bristles in their axils.

Illustrations: Blühende Kakteen 2: pl. 63; Schumann, Gesamtb. Kakteen Nachtr. f. 31, as *Echinocactus froehlichianus;* Mem. Accad. Sci. Torino 37[1]: pl. 16, f. 2, as *Cactus curvispinus;* Schelle, Handb. Kakteenk. 193. f. 126, as *Echinocactus curvispinus.*

26. Malacocarpus mammillarioides (Hooker).

Echinocactus mammillarioides Hooker in Curtis's Bot. Mag. 64: pl. 3558. 1837.
Echinocactus hybocentrus Lehmann in Pfeiffer, Enum. Cact. 65. 1837.
Echinocactus centeterius Lehmann in Pfeiffer, Enum. Cact. 65. 1837.
Echinocactus pachycentrus Lehmann in Pfeiffer, Enum. Cact. 66. 1837.
Echinocactus centeterius major Lemaire and Monville in Lemaire, Cact. Gen. Nov. Sp. 91. 1839.
Echinocactus nummularioides Steudel, Nom. ed. 2. 1: 536. 1840.
Echinocactus centeterius pachycentrus Salm-Dyck, Cact. Hort. Dyck. 1849. 33. 1850.
Echinocactus centeterius grandiflorus Labouret, Monogr. Cact. 244. 1853.

Subglobose to short-cylindric, bright green; ribs about 14 to 16, broad, obtuse, strongly tubercled; areoles rather large, felted; spines about 7, short, spreading, slender; flowers large, yellowish red; perianth-segments oblong, obtuse; ovary bearing small scales with a little wool in their axils.

Type locality: Chile.

Distribution: Chile.

This species was introduced by a Mr. Hitchen from Chile and flowered in 1836.

The status of this species is very confusing. It was described very briefly by Hooker who had never seen the living plant; its exact habitat was not given and it has never with certainty been re-collected.

It was referred by Lemaire in 1840 as a synonym of *Echinocactus centeterius*, but as a matter of fact it must have had a prior publication, although both names first appeared the same year, 1837.*

In spite of the difference in size and shape of the flowers, Lemaire (Hort. Univ. **2**: 161. 1841) is positive that it is the same as the plant which he illustrates and yet he designates his illustration as var. *major!*

Echinocactus centeterius, to which it is generally referred, is scarcely less confusing. It seems to have been named and distributed by Lehmann, but was first described by Pfeiffer in 1837 and figured by him about 1843. His plant is small with rather small flowers; the perianth-segments are broad and abruptly acute. He states definitely that the plant comes from Minas Geraes, Brazil. As figured by Lemaire, where mentioned above, the flowers are very large with narrow elongated perianth-segments; in 1843 it was figured and described by Hooker. He describes a larger plant than the type and the flowers are somewhat different, the perianth-segments being spatulate and toothed above.

Förster (Handb. Cact. 296. 1846) redescribes the species, referring here *Echinocactus mammillarioides* Hooker (Curtis's Bot. Mag. **64**: pl. 3558) as a large form under the name of *E. centeterius major* of Cels.

In 1853 Labouret redescribes the species and makes *Echinocactus pachycentrus* a variety and synonymous with *Echinocactus mammillarioides* and *Echinocactus centeterius major* Monville and also the variety *grandiflorus* based on the description of Lemaire (Hort. Univ. **2**: 161). He also states that the species comes from Mexico and Minas Geraes.

In 1882 Regel in the Gartenflora (**30**: 258. pl. 1094) describes and figures this species and the variety *major* from plants sent by Dr. Philippi from Chile.

Rümpler (Förster, Handb. Cact. ed. 2. 568. f. 73, 74. 1885) redescribes the species and also reproduces the illustrations from Gartenflora, but adds nothing new except the statement that the species is also found in Peru and Chile.

Finally, Schumann (Gesamtb. Kakteen 418, 419. 1898) states that it surely comes from the Andes of Argentina, but he would exclude it from Mexico and Brazil. After a careful study of the works mentioned above and a comparison of all the illustrations cited below we are convinced that several species may be involved, but we have not been able to disentangle them.

Illustrations: Pfeiffer and Otto, Abbild. Beschr. Cact. **1**: pl. 2; Förster, Handb. Cact. ed. 2. f. 73, 74; Curtis's Bot. Mag. **69**: pl. 3974; Gartenflora **31**: f. 1094, a; Schumann, Gesamtb. Kakteen f. 73; Monatsschr. Kakteenk. **27**: 60; Loudon, Encycl. Pl. ed. 3. 1378. f. 19378; Herb. Génér. Amat. II. **2**: pl. 56, as *Echinocactus centeterius;* Pfeiffer and Otto, Abbild. Beschr. Cact. **1**: pl. 21, as *Echinocactus hybocentrus;* Curtis's Bot. Mag. **64**: pl. 3558; Loudon, Encycl. Pl. ed. 2 and 3. 1201. f. 17354, as *Echinocactus mammillarioides;* Hort. Univ. **2**: pl. 16; Gartenflora **31**: f. 1094, b, as *Echinocactus centeterius major.*

27. **Malacocarpus leninghausii** (Haage jr.).

Pilocereus leninghausii Haage jr., Monatsschr. Kakteenk. **5**: 147. 1895.
Echinocactus leninghausii Schumann, Monatsschr. Kakteenk. **5**: 189. 1895.

Stem slender, cylindric, sometimes 1 meter long, 10 cm. in diameter; ribs about 30, low, obtuse; radial spines about 15, setaceous; central spines 3 or 4, longer than the radials, 4 cm. long, yellow; flowers 5 cm. broad, citron-yellow; scales on the ovary bristly in their axils.

Type locality: Not cited.

Distribution: Southern Brazil.

This is a very curious plant which has long been cultivated in Europe, but has only recently flowered in cultivation. Dr. Rose found it being widely propagated, but saw

*Curtis's Botanical Magazine, volume 64, plate 3558, appeared in March 1837 while Pfeiffer's Enumeratio Diagnostica Cactearum appeared probably after August and before November of the same year.

neither flowers nor fruit. We have taken it up in *Malacocarpus* since its relationship appears nearer to species of this genus than to those of other described genera.

The name *Echinocactus leninghausii cristatus* is given by Schelle (Handb. Kakteenk. 178. 1907).

Illustrations: Cact. Journ. 2: 4, as *Pilocereus leninghausii;* Schelle, Handb. Kakteenk. 178. f. 110; Möllers Deutsche Gärt. Zeit. 25: 474. f. 6, No. 5; 27; Haage and Schmidt, Haupt-Verz. 1919: 169; 1920: 127. f. 10779; De Laet, Cat. Gén. f. 7, as *Echinocactus leninghausii.*

28. Malacocarpus graessneri (Schumann).

Echinocactus graessneri Schumann, Monatsschr. Kakteenk. 13: 130. 1903.

Stems simple, depressed, 5 to 6 cm. high. 9 to 10 cm. in diameter, somewhat umbilicate at apex; ribs very numerous (more than 60), low, usually arranged in spirals, tuberculate; areoles bearing numerous bright yellow spines, 2 cm. long, the 3 to 6 central spines stouter and darker yellow; flowers small, narrow, from near the center of the plant.

Type locality: State of Rio Grande do Sul, Brazil.
Distribution: Southern Brazil.

This species must be a near relative of *M. haselbergii,* but with more ribs and slightly different spines and flowers. Both species are referred to this genus only tentatively. They very much resemble *Rebutia fiebrigii* in their form, ribs, and spines. *Echinocactus graessneri* is offered in the trade catalogues of Europe, but we know it only from descriptions and illustrations and from some small plants sent us by Haage and Schmidt.

Illustrations: Monatsschr. Kakteenk. 23: 3; Gartenwelt 15: 536; Möllers Deutsche Gärt. Zeit. 25: 474. f. 6, No. 20; 489. f. 23, as *Echinocactus graessneri.*

29. Malacocarpus escayachensis (Vaupel).

Echinocactus escayachensis Vaupel, Monatsschr. Kakteenk. 26: 125. 1916.

Globose, 12 cm. in diameter, very woolly at apex; ribs about 15; areoles approximate, short-tomentose; spines about 20, unequal, some curved, others straight; flower 2.5 cm. long.

Type locality: Escayache near Tarija, Bolivia.
Distribution: Southern Bolivia.

MALACOCARPUS sp.

Simple, or in clusters, short-cylindric, 1 dm. high; ribs about 15, low, broad, somewhat tubercled; radial spines 10 to 12, acicular, ascending, 2 to 3 cm. long, brownish, darker toward the tip; central spine usually solitary and hooked, a little stouter than the radials; flowers dull red, small, extending only a short distance beyond the spines.

Collected by Juan Söhrens in Tacna, Chile, altitude 3,000 meters, in 1911. Dr. Rose obtained a few clusters of spines from Mr. Söhrens's specimen in 1914. Mr. Söhrens has a photograph of it also.

The above species does not agree with any of the known species of South America. It is the only one of the *Echinocactus* relationship on the Pacific side of South America which has hooked spines. Mr. Söhrens believed it was a new species of *Echinocactus.*

PUBLISHED OR RECORDED SPECIES, PROBABLY REFERABLE TO THIS GENUS.

ECHINOCACTUS ELACHISANTHUS Weber, Bull. Mus. Hist. Nat. Paris 10: 387. 1904.

Stem cylindric, 25 cm. high, 12 cm. in diameter; ribs very numerous, 45 or more, spiraled, divided into tubercles; radial spines 12 to 15, setaceous, white, 5 to 12 mm. long; flowers very small, 12 to 15 mm. long; flower-tube very short; perianth-segments yellowish green; ovary green, small, spiny; fruit greenish, 5 to 6 mm. in diameter; seeds small, dark brown.

Type locality: Northeast of Maldonado, Uruguay.
Distribution: Uruguay.

ECHINOCACTUS INTRICATUS Link and Otto, Verh. Ver. Beförd. Gartenb. 3: 428. 1827.

Melocactus intricatus Link and Otto, Verh. Ver. Beförd. Gartenb. 3: pl. 24. 1827.

Ovoid, 10 cm. high, green; ribs 20, obtuse; radial spines 14 to 16, spreading, 8 mm. long; central spines 4, stouter than the radials, 16 mm. long; flowers and fruit unknown.

The plant is said to have come from Montevideo and to have been collected by Sellow.

ECHINOCACTUS WEINGARTIANUS Haage jr. in Quehl, Monatsschr. Kakteenk. 9: 73. 1899.

Short-columnar, rounded above; crown lightly tubercled, with sparse wool, exceeded by the upright spines, but can be seen, 8 cm. high by 5.5 cm. in diameter, bright green when young, later turning gray; ribs 13, straight, separated by sharp furrows, about 1 cm. high, divided into tubercles, broadening out with age; areoles 10 to 12 mm. apart, very large, covered with yellowish, curly wool turning gray and finally disappearing; radial spines 5 to 10, of various sizes, when young brownish black on the tips and base, horn-colored in the middle, more or less upright, later becoming white, more spreading; central spines up to 4, upright, when young a few ebony-black, the rest shading into the color of the radial spines, the uppermost and stoutest always black, up to 3 cm. long, bent above; flowers (according to traces) numerous in the region of the crown; seeds small, kidney-shaped, dark grayish brown, tubercled.

Distribution: Argentina.

ECHINOCACTUS SANJUANENSIS Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 501. 1905.

Nearly globose, 8 to 9 cm. in diameter; ribs 13, rather broad and low, strongly tubercled; areoles nearly circular, prominent, 4 mm. in diameter; spines 15 to 19, slender, rigid, 1 to 2.5 cm. long, at first rose-colored, becoming in age blackish.

Type locality: Province of San Juan.

Distribution: Western Argentina.

We know this species definitely only from the original description and a photograph obtained by Dr. Rose in 1915 from Dr. Spegazzini.

ECHINOCACTUS ROTHERIANUS Haage jr. in Quehl, Monatsschr. Kakteenk. 9: 74. 1899.

Simple, slender, crooked, up to 26 cm. high and 5 cm. in diameter near the crown, constricted below; crown somewhat sunken and somewhat woolly, exceeded by the central spines of the new areoles; ribs 23, straight, separated by sharp furrows about 5 cm. deep, tubercled; tubercles slightly bent downward and bearing areoles, bright olive-green; areoles 5 mm. apart, naked; radial spines about 10, radiating, the lateral longer than the upper and lower, up to 5 mm. long, bright amber in color; central spines about 4, upright, stouter and longer (up to 10 mm.) than the radial spines, thickened at the base, reddish when young, otherwise colored like the radial spines; later all the spines bending downward and mixing together; these stiff, brittle, and finally disappearing, leaving the body naked; flowers unknown.

Type locality: Paraguay.

The following descriptions are translated from Fries who described three plants which he referred to *Echinocactus* but gave no specific names. They are evidently better referred to *Malacocarpus* or to some other South American genus.

"ECHINOCACTUS sp.

"Prov. Jujuy; in rocky places in Yavi, 3,400 m. alt.

"Spherical, up to 1 dm. high; ribs 13, more or less divided into conical tubercles; radial spines about 8, directed obliquely outward, 3 to 3.5 cm. long; central spine 1, stouter, projecting straight outward, 3 to 8 cm. long, twisted-round, crooked above; flowers collected on the summit, 2.5 to 3 cm. long, with thick wool on the outside." (Fries, Nov. Act. Reg. Soc. Upsal IV. 1: 121. 1905.)

"ECHINOCACTUS sp.

"Prov. Jujuy; in rocky places at Moreno, 3,500 m. alt.

"Plant 2 to 3 dm. high, 1 to 2 dm. in diameter, short-cylindric; ribs about 30, plainly divided into tubercles; areoles covered with thick wool; spines up to 17, bent outward, up to 5 cm. long, stiff, twisted, straight; the areoles on the summit are spineless; the flowers are 5 to 10 cm. from the growing point, are 4 to 5 cm. long, are covered with thick wool; petals reddish brown." (Fries, Nov. Act. Reg. Soc. Upsal IV. 1: 122. 1905.)

"ECHINOCACTUS sp.

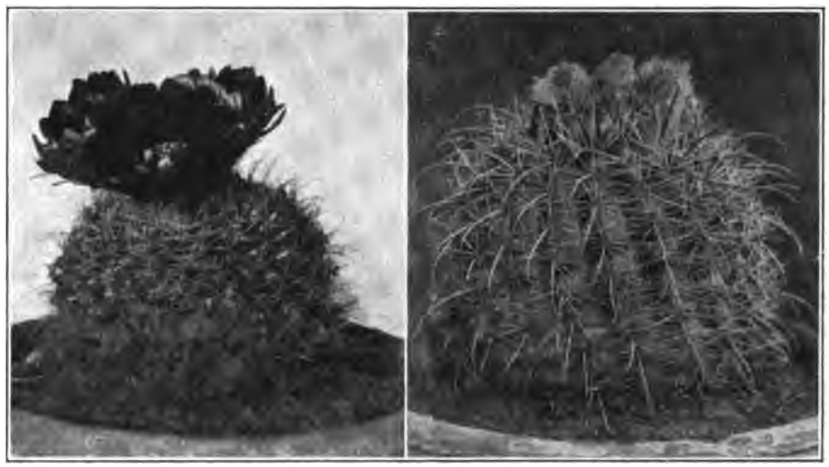
"Prov. Jujuy; among rocks at Moreno, 3,500 m. alt.

"Very similar in habit to *Echinocactus nidus* Söhrens, as shown in Monatsschr. Kakteenk. **10**: 122; since, however, no description of that species is furnished, I can not tell whether or not these are identical.

"Spherical, 3 to 4 dm. high; ribs running spirally, divided into well-marked tubercles; areoles oval, covered with wool; radial spines and central spines little differentiated, all together 20 to 25, up to 45 cm. long, the outer ones more or less pressed on the plant-body, forming an extraordinarily thick network; the summit is naked, the spines closing in over it; the finer spines are white, the stouter ones golden-yellow at the base, lilac-colored in the middle, violet at the tips; the flowers appear about 2 cm. from the growing-point; they are yellowish green, 3.5 to 4 cm. long." (Fries, Nov. Act. Reg. Soc. Upsal. IV. **1**: 121, 122. 1905.)

24. **HICKENIA** gen. nov.

Small, usually globular, very spiny cacti; ribs more or less definite, sometimes spiraled, divided into low, rounded tubercles; spines radial and central, one of the latter strongly hooked; flowers central, large for the size of the plant, borne at the top of the very young tubercles, subcampanulate, with a broad spreading limb; scales on ovary and flower-tube small, their axils filled with wool and bristles; fruit small, oblong, thin-walled, many-seeded; seeds minute, brown, shining, smooth, with a prominent white corky hilum.



FIGS. 220 and 221.—Hickenia microsperma.

Type species: *Echinocactus microspermus* Weber.

The genus is named for Dr. C. Hicken, professor in the University of Buenos Aires.

Only one species is here recognized, a native of Argentina, but we find such great diversity in the spines, arrangement of the tubercles, and the color and size of the flowers that we suspect that more material would lead to some segregations.

1. Hickenia microsperma (Weber).

Echinocactus microspermus Weber, Dict. Hort. Bois 469. 1896.
Echinocactus microspermus macrancistrus Schumann, Monatsschr. Kakteenk. **12**: 157. 1902.

Simple or in small clusters, usually globular, sometimes short-cylindric and 2 dm. high, 5 to 10 cm. in diameter, the surface divided into low tubercles; tubercles arranged in definite straight or spiraled ribs or very indefinitely arranged; radial spines 11 to 25, white, acicular, spreading, 4 to 6 mm. long; central spines 3 or 4, red to brown, subulate, glabrous or pubescent, the lowest one hooked at apex, ascending, spreading, or reflexed; flowers variable in color, bright yellow to red, 2 to 4 cm. broad; filaments red; style and stigma-lobes light reddish yellow; seeds 0.5 mm. long.

Type locality: Tucuman, Argentina.
Distribution: Northern Argentina.

Dr. Spegazzini has described two varieties, *erythranthus* and *thionanthus* (Anal. Mus. Nac. Buenos Aires III. 4: 498. 1905) which have different-sized flowers and different-colored filaments and which suggest the probability of there being more than one species in this genus.

The varieties *brevispinus* Haage jr. and *elegans* Haage jr. are in the trade.

Two forms were also collected by Dr. Shafer in Argentina in 1917, both of which have flowered in the New York Botanical Garden. No. 9 has small yellow flowers, less than 2 cm. long, with yellow filaments and style; No. 18 has large red flowers, 4 cm. long with red filaments.

Illustrations: Gartenwelt 7: 281; De Laet, Cat. Gén. f. 20; Monatsschr. Kakteenk. 7: 105; 12: 155; 16: 48; Blühende Kakteen 1: pl. 1; Schumann, Gesamtb. Kakteen f. 68; Nachtr. 109. f. 22; Curtis's Bot. Mag. 128: pl. 7840, as *Echinocactus microspermus;* Monatsschr. Kakteenk. 12: 155; 31: 59; Schumann, Gesamtb. Kakteen Nachtr. 110. f. 23, as *Echinocactus microspermus macrancistrus.*

Plate XXIII, figure 1, shows a plant collected by Dr. Shafer at Andalgala, Argentina, in 1917 (No. 9), which flowered in the New York Botanical Garden, January 4, 1920. Figures 220, 221, and 222 are from photographs furnished by Dr. Spegazzini.

FIG. 222.—Hickenia microsperma.

25. FRAILEA gen. nov.

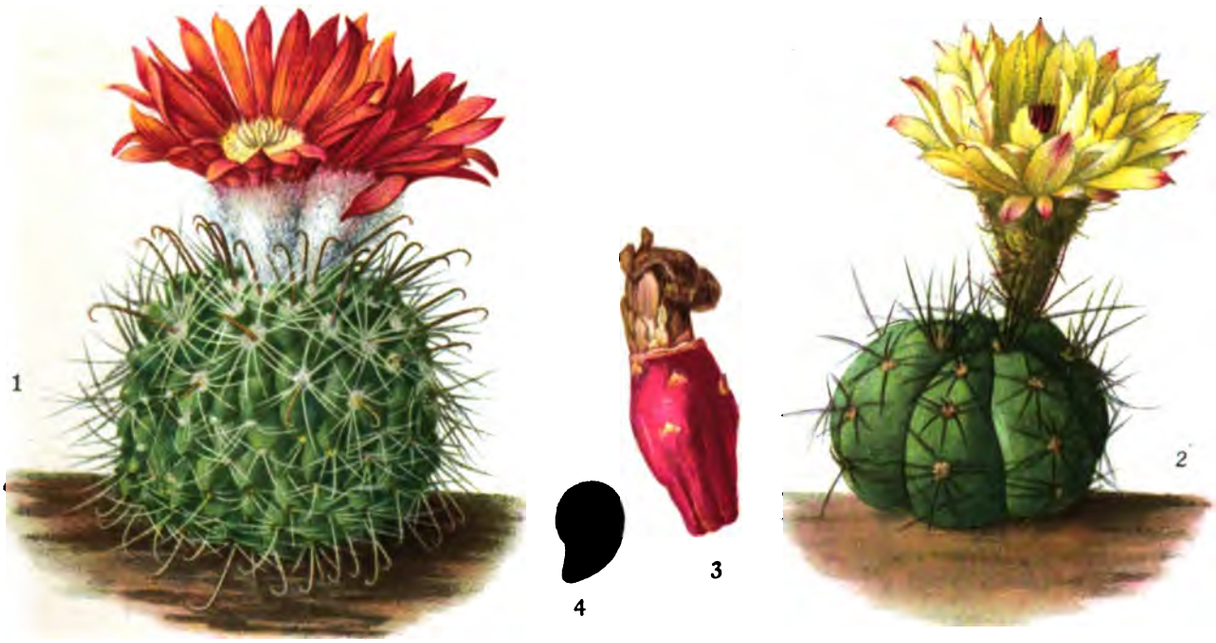
Plants small, globular or cylindric, with the apex rounded or depressed, usually cespitose; ribs numerous, low, divided into tubercles, these bearing small spines; flowers small, often cleistogamous, arising from the apex of the central tubercles; fruit small, spherical to ellipsoid, bearing narrow yellow scales with hair-like bristles in their axils, these forming a crest to the flower; seeds black or brown, smooth or pubescent, shining, with a triangular, deeply concave face; embryo straight (!), splitting the testa on the back of the seed in germinating; endosperm wanting; cotyledons minute, if at all developed.

Type species: *Echinocactus cataphractus* Dams.

These plants very much resemble some of the small species of *Mammillaria,* but the low tubercles are more definitely arranged on ribs and the flowers and fruit are very different; the seeds are much like those of *Epithelantha,* but the flowers are different and the fruit is scaly. The flowers of this genus are not very well known; several of the species have been described as having the flowers often cleistogamous and it may be that they all are. We have had two or three of the species under observation for several years. Flower-buds are often formed and occasionally ripe fruit with fertile seed is produced, but we have never seen open flowers or indications that they had opened. The flowers may open at night, but we doubt it; they certainly do not in day-light.

While the species of this group which we know from living plants clearly represent a very distinct generic type, we are not quite certain whether *Echinocactus caespitosus* belongs here or not. Its larger flowers suggest a possibility of its being related to *Malacocarpus* and indeed Spegazzini states that it is near *E. concinnus.*

The genus is named for Manuel Fraile who was born at Salamanca, Spain, in 1850, and who for years has diligently cared for the cactus collection in the U. S. Department of Agriculture, Washington, D. C. Eight species are recognized.



5

M. E. Eaton del. A Horn & Co

1. Flowering plant of *Hickenia microsperma*.
2. Flowering plant of *Malacocarpus ottonis*.
3. Fruit of *Sclerocactus polyancistrus*.
4. Seed of same.
5. Flowering plant of *Echinofossulocactus violaciflorus*.

(All natural size, except seed.)

KEY TO SPECIES.

Stems cylindric, usually simple ..... 1. *F. gracillima*
Stems globular, more or less cespitose.
  Seeds puberulent ..... 2. *F. grahliana*
  Seeds smooth.
    Ribs more distinct than in the other species ..... 3. *F. pumila*
    Ribs very indistinct.
      Radial spines 12 to 14 ..... 4. *F. schilinskyana*
      Radial spines 5 to 9.
        Plants usually simple; fruit red ..... 5. *F. cataphracta*
        Plants cespitose; fruit black ..... 6. *F. pygmaea*
Uncertain relationship ..... 7. *F. caespitosa*, 8. *F. knippeliana*

1. Frailea gracillima (Lemaire).

Echinocactus gracillimus Monville in Lemaire, Cact. Gen. Nov. Sp. 24. 1839.
Echinocactus pumilus gracillimus Schumann, Gesamtb. Kakteen 394. 1898.

Cylindric, simple, 10 cm. high, 2.5 cm. in diameter, grayish green; ribs about 13, but indistinct, more or less spiraled, tuberculate; areoles small, with a purple blotch beneath each one; radial spines about 16, setaceous, white, 2 mm. long, more or less appressed; central spines 2 to 4, more or less unequal, 4 to 8 mm. long; flowers yellow, 3 cm. long; scales on the ovary and flower-tube woolly and bristly in their axils; fruit 6 mm. in diameter; seeds 1.5 mm. long.

Type locality: Not cited.

Distribution: Paraguay.

Echinocactus gracilis (Förster, Handb. Cact. 304. 1846) is given as a synonym of this species, but was not described. This is probably the *E. gracilis* Lemaire of collections (Monatsschr. Kakteenk. 10: 16. 1900).

Illustration: Monatsschr. Kakteenk. 9: 55, A, as *Echinocactus gracillimus*.

2. Frailea grahliana (Haage jr.).

Echinocactus grahlianus Haage jr. in Schumann, Monatsschr. Kakteenk. 9: 54. 1899.
Cactus grahlianus Kuntze, Deutsch. Bot. Monatsschr. 21: 193. 1903.

Cespitose; plants small, depressed-globose, 3 to 4 cm. in diameter; ribs about 13, low and indistinct; spines all radial, 9 or 10, subulate, appressed, somewhat curved backward, 3.5 mm. long; flowers 4 cm. long, yellowish; fruit 6 mm. in diameter; seeds brown, puberulent.

Type locality: Paraguari, Paraguay.

Distribution: Paraguay; also Argentina, according to Spegazzini.

Echinocactus grahilianus adustior (Monatsschr. Kakteenk. 14: 156. 1904) is only mentioned.

Illustrations: Schumann, Gesamtb. Kakteen Nachtr. f. 20; Monatsschr. Kakteenk. 9: 55, B; 12: 141, as *Echinocactus grahlianus*.

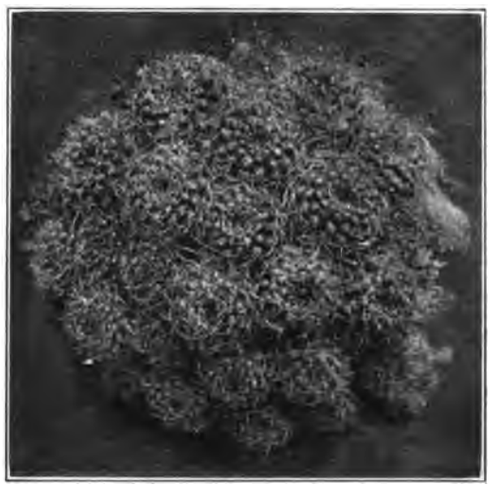


FIG. 223.—Frailea pumila.

3. Frailea pumila (Lemaire).

Echinocactus pumilus Lemaire, Cact. Aliq. Nov. 21. 1838.

Plant cespitose, small, globose, umbilicate at apex, deep green, sometimes becoming reddish; ribs 13 to 15, more distinct than in the related species, more or less tuberculate; areoles small, nearly circular; spines all pubescent, yellowish brown; radial spines 9 to 14, setaceous, more or less appressed; central spines 1 or 2, flower 2 cm. long, yellow; axils of scales on the ovary and flower-tube woolly and setose; seeds smooth, brown, obovate, 1.5 mm. long, angled on the back; depressed hilum much smaller than in *Frailea cataphracta*.

Type locality: Not cited.

Distribution: Paraguay and Argentina.

This species, the first of the group to be described, is not even now very well understood. The description of the seeds given above is drawn from Dr. Shafer's plant from Concordia, Argentina (No. 125); he notes that it grows in gravel and, being inconspicuous, is hard to find.

In 1920 Dr. C. Fiebrig, Director of the Botanical Garden at Asuncion, Paraguay, sent us a fine specimen; it is very cespitose, with 20 heads or more, forming a low mound nearly 10 cm. in diameter.

Illustrations: Knippel, Kakteen pl. 8; Monatsschr. Kakteenk. 9: 55, C, as *Echinocactus pumilus*.

Figure 223 shows a potted plant sent by Dr. Fiebrig in 1920 (No. 7).

4. Frailea schilinzkyana (Haage jr.).

Echinocactus schilinzkyanus Haage jr. in Schumann, Monatsschr. Kakteenk. 7: 108. 1897.
Cactus schilinzkyanus Kuntze, Deutsch. Bot. Monatsschr. 21: 193. 1903.

Simple or somewhat cespitose, usually globular, somewhat flattened above, about 3 cm. in diameter, but umbilicate at apex; ribs 10 to 13, but very indistinct, more or less spiraled, strongly tubercled; radial spines 12 to 14, 2 to 3 mm. long, more or less appressed and reflexed; central spine solitary, stouter than the radials; flowers small, often cleistogamous; fruit yellowish.

Type locality: Meadows near the River Paraguari, Paraguay.

Distribution: Paraguay; also Argentina, according to Spegazzini.

Nicholson (Dict. Gard. Suppl. 336. 1900) states that "this may be a *Mammillaria*."

Echinocactus schilinzkyanus grandiflorus Haage jr. (Monatsschr. Kakteenk. 8: 143. 1898) is only mentioned.

Illustrations: Cact. Journ. 1: 45; Schelle, Handb. Kakteenk. 183. f. 117; Schumann, Gesamtb. Kakteen Nachtr. f. 21; Monatsschr. Kakteenk. 9: 55, D, as *Echinocactus schilinzkyanus*.

5. Frailea cataphracta (Dams).

Echinocactus cataphractus Dams, Monatsschr. Kakteenk. 14: 172. 1904.

Small, globose plants, 1 to 2 cm. in diameter, deeply umbilicate at apex, simple or sometimes proliferous, dull green; ribs low and broad, 10 to 15; tubercles flattened above, each with a purple lunate band near the margin; radial spines 5 to 9, straight, 1 to 2 mm. long, appressed, yellowish or white; central spines none; flowers evidently minute, but unknown; fruit small; seeds comparatively large, 2 mm. broad.

Type locality: Described from greenhouse plants. Supposed to have come from Paraguay.

Distribution: Paraguay.

Seeds planted November 24, 1912, developed into plants which flowered in March 1915. In the case of a plant which fruited in 1914 the seeds were carried away by ants and were found germinating in the sand in March 1915.

6. Frailea pygmaea (Spegazzini).

Echinocactus pygmaeus Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 497. 1905.

Simple or cespitose, half buried in the ground, globose, umbilicate at apex, with a turbinate base, 1 to 3 cm. in diameter, dull green; ribs 13 to 21, obtuse, low, divided by transverse depressions into tubercles; spines 6 to 9, white, setaceous, 1 to 4 mm. long, appressed; flowers from the apex of the plant, often cleistogamous, with dense, rose-colored pubescence without, 2 to 2.5 cm. long; inner perianth-segments lanceolate, acute, yellow; filaments and style white; stigma-lobes yellowish; seeds 2 mm. long, black, shining, with a large oblong hilum nearly as long as the body.

Type locality: Mountains about Montevideo, Uruguay.

Distribution: Uruguay and province of Entre Rios, Argentina.

Echinocactus pygmaeus phaeodiscus (Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 498. 1905) is similar to the type, but has lower ribs, blackish areoles, and 6 to 12

spines from an areole; flowers said to be like those of the type. It also suggests *Frailea cataphracta*.

We obtained a flower and seeds of this species from Dr. Spegazzini and have also examined a sketch made by him.

Illustration: Anal. Mus. Nac. Montevideo 5: pl. 17, as *Echinocactus pygmaeus*.

7. Frailea caespitosa (Spegazzini).

Echinocactus caespitosus Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 495. 1905.

Simple or densely cespitose, half buried in the ground; separate plants small, turbinate to clavate or even oblong, 4 to 7 cm. long, 1.5 to 4.5 cm. in diameter, deeply umbilicate at apex; ribs 11 to 22, low, obtuse, 4 to 5 mm. broad, somewhat crenate; areoles orbicular to short-elliptic, 3 to 4 mm. apart; radial spines 9 to 11, setaceous, appressed, yellowish, very short, 3 to 6 mm. long; central spines 1 to 4, unequal, more or less curved, the longest one 10 to 15 mm. long; flowers small, 3.5 to 4 cm. long; inner perianth-segments yellow, lanceolate, acute; filaments yellow; style white; stigma-lobes purplish violet; axils of scales on ovary and flower-tube densely gray-tomentose and setose.

Type locality: Mountains near Montevideo.
Distribution: Uruguay.

8. Frailea knippeliana (Quehl).

Echinocactus knippelianus Quehl, Monatsschr. Kakteenk. 12: 9. 1902.

Simple, small, cylindric, 6 cm. high, 2 cm. in diameter; ribs 15, low, divided into tubercles; spines about 16, yellowish; flowers 2.5 cm. long, yellowish; wool in the axils of the flower-scales long, white; seed 1.5 cm. long.

Type locality: Paraguay.
Distribution: Paraguay.

We know this species from descriptions and illustrations and from a single flower sent by L. Quehl in 1912.

Quehl and Schumann place it near *Echinocactus gracillimus*.

Illustrations: Knippel, Kakteen pl. 8; Schelle, Handb. Kakteenk. f. 118, as *Echinocactus knippelianus*.

26. MILA gen. nov.

Plants growing in small clumps, more or less cylindric, resembling in habit and texture some of the species of *Echinocereus;* ribs low, bearing closely set areoles with acicular spines; flowers small, campanulate, yellow, borne at the apex of the plant; scales on the ovary and flower-tube minute, bearing a few long white hairs in their axils; fruit small, globular, green, shining, nearly naked, at first juicy; seeds black, tuberculate, longer than broad, hilum large, subbasal, white.

Type species: *Mila caespitosa* Britton and Rose.

The generic name is an anagram of Lima, the city in Peru near which the plant is found. Only one species is known.

1. Mila caespitosa sp. nov.

Plants low, rarely as much as 15 cm. high, 2 to 3 cm. in diameter; ribs usually 10, 3 to 5 mm. high, the margins nearly straight; areoles at first densely brown-felted, 2 to 4 mm. apart; spines at first yellowish with brown tips, in age becoming brown throughout; radial spines 20 or more, usually about 10 mm. long; central spines several, the longer ones up to 3 cm. long; flowers about 1.5 cm. long, yellow but drying reddish; inner perianth-segments oblong; tube-proper very short; stamens shorter than the perianth-segments; style 8 mm. long; fruit 5 to 10 mm. in diameter; seed 1 mm. long.

Collected by J. N. Rose near Santa Clara, Peru, July 3, 1914 (No. 18555, type). This plant is common near the mouth of the narrow valleys between the low hills bordering on the Remac Valley. It does not extend into the main valley which is here devoid of all vegetation. In early July Dr. Rose found it both in flower and fruit. It is not closely related in flower, fruit, or appearance to any of the so-called species of *Echinocactus*.

Dr. and Mrs. Rose collected, July 9, 1914, at Matucana, much higher up the mountains than Santa Clara, two other specimens (Nos. 18652 and 18653); in the field these seemed different from each other as well as different from the Santa Clara plant, but as neither was in flower nor fruit and as they have not flowered in cultivation we are unable to identify them, but in any case they are doubtless associated with the above.

The plant much resembles in its habit some of the species of *Echinocereus*, but it has very different flowers and fruit. Rümpler describes a species of *Echinocereus* (*E. flavescens* Förster, Handb. Cact. ed. 2. 826. 1885) which from its name, description, and locality suggests that it might be this species. Rümpler credits the name to Otto who described a *Cereus flavescens* (Pfeiffer, Enum. Cact. 79. 1837), but without citing a locality for it. A little later the Wilkes's Expedition collected near Lima a plant which we believe is the same as ours and which Engelmann referred to *Mammillaria flavescens*, a quite different species. The use of the same specific name is simply a coincidence for the indications are that Engelmann did not know of Otto's name.

The following account by Dr. Asa Gray appeared in Wilkes, U. S. Exploring Expedition (13: 660. 1854).

"There are no specimens in the collection; but there is a good drawing, made from the living plant by the late Mr. Agate; from which Dr. Engelmann has drawn up the characters given above and the subjoined description and remarks.—'*Stems several* from the same very *thick root*, or proliferous at the base, 2½ to 3 inches high, an inch and a half or less in diameter, *ovoid-cylindrical; the setaceous straight prickles* half an inch in length, *brown*. *Flowers upright* from the summit of the stems, 14 lines long, 9 lines in diameter; the spreading sepals about 20 in number, *linear-oblong, obtuse*, yellowish; *petals* about the same number, *ovate-oblong, obtusish, yellow*. Style half an inch long; *stigmas* 9, *radiate*.'

"*M. flavescens* is one of the very few species coming from tropical South America. The descriptions which I find in different works agree tolerably well with our plant; though the stems are said to be proliferous towards the summit, the spines are generally lighter-colored and the yellow flowers appear in a ring around the top."

Inquiry regarding Agate's drawing, referred to above, at the Gray Herbarium and at the Missouri Botanical Garden, as well as an examination of Wilkes's manuscripts in the U. S. National Museum at Washington, D. C., have been without results.

Plate XXII, figure 2, shows the type plant collected by Dr. Rose in 1914 which fruited at the New York Botanical Garden.

27. SCLEROCACTUS gen. nov.

Usually simple but sometimes clustered, spiny cacti; ribs rather prominent, more or less undulate or tubercled; spine-clusters well developed, some of the central ones hooked, the others straight; flowers forming on the young areoles above and adjacent to the spine-cluster, subcampanulate, purplish; ovary oblong, bearing thin scattered scales, each with a tuft of short wool in its axils; fruit oblong to pyriform, nearly naked, dehiscing by a basal pore; seeds large, black, tuberculate; hilum lateral, large; embryo strongly curved; endosperm abundant.

Two species are known from the deserts of California, Utah, Colorado, Arizona, and southern Nevada, of which *Echinocactus polyancistrus* Engelmann and Bigelow is the type. The habit of the plants resembles somewhat that of *Ferocactus*, but the fruit is nearly naked and the scales bear small tufts of wool in their axils. The seeds, too, are not smooth or pitted as in *Ferocactus* but are tuberculate.

The generic name is from σκληρός hard, cruel, obstinate, and κάκτος cactus, referring to the formidable hooked spines which hold on in a most aggravating manner.

KEY TO SPECIES.

Style puberulent; flower 3 to 4 cm. long ..... 1. *S. whipplei*
Style glabrous; flower 7 to 8 cm. long ..... 2. *S. polyancistrus*

1. Sclerocactus whipplei (Engelmann and Bigelow).

Echinocactus whipplei Engelmann and Bigelow in Engelmann, Proc. Amer. Acad. 3: 271. 1856.
Echinocactus whipplei spinosior Engelmann, Trans. St. Louis Acad. 2: 199. 1863.

Usually single, but sometimes in small clusters, globose, 7.5 cm. in diameter or oblong and up to 15 cm. long; ribs 13 to 15, often spiraled, prominent, more or less tubercled; spines on seedlings all radials but on old plants both radials and centrals; radial spines 7 to 11, somewhat flattened, spreading or recurved, 12 to 18 mm. long, mostly white, but some black; central spines usually 4, the uppermost one flattened and straight, all or only one of the 3 lower ones hooked, usually brown or black, stouter than the radials; flowers from near the center of the plant, often abundant, short-campanulate, purplish to rose-colored, 3 to 4 cm. long; outer perianth-segments green with pale margins, broad, obtuse or acute; inner perianth-segments lavender, oblong, acuminate; tube-proper very short; filaments lavender; style reddish, puberulent throughout; fruit oblong, 1.5 cm. long, red, nearly naked; scales on the fruit small, hyaline, each bearing in its axil a small tuft of hair; seeds 3 to 3.4 mm. long, much larger at the upper end than at the lower; hilum large, lateral on the lower half of the seed; "embryo curved, about three-fourths around a rather copious albumen."

Type locality: On the Little Colorado in Arizona.

Distribution: Northern Arizona, southeastern Utah, and western Colorado.

According to Mr. M. E. Jones who knows this species very well it is found only on the high mesas growing in clayey soil. It is an inconspicuous plant usually found singly under small bushes and is easily overlooked except when in flower. The species has a wide range and shows considerable variation in number, color, and shape of spines, but we are not disposed to recognize the variety *spinosior* which seems to grade into the type.

This cactus is remarkable in having a puberulent style and is the only one we recall of the many species of cacti examined in which the style is puberulent throughout.

E. whipplei nanus (Monatsschr. Kakteenk. 10: 119. 1900) we do not know; it is doubtless only a form.

Echinocactus glaucus Schumann (Gesamtb. Kakteen 438. 1898), of which *E. subglaucus* Rydberg (Fl. Rocky Mountains 580. 1917) is a change of name, based on Purpus's plant from Dry Creek, Mesa Grande, Colorado, probably belongs here, although we have not seen the type specimen. Here we would refer specimens so named by Standley from northwestern Arizona.

Echinocactus pubispinus Engelmann (Trans. St. Louis Acad. 2: 199. 1863), which came from Pleasant Valley near Salt Lake Desert, is known only from the type which was without flowers or fruit. It is certainly related to this species if not identical with it. It is described as having pubescent spines, a character also possessed by *E. whipplei* in the early stages of its growth.

Echinocactus spinosior Brandegee, referred to by Purpus (Monatsschr. Kakteenk. 10: 97. 1900), although never published, doubtless refers to the variety of this species with the same name.

Illustrations: Pac. R. Rep. 4: pl. 1; Cact. Journ. 1: pl. V, in part; Stand. Cycl. Hort. Bailey 2: f. 1371; Möllers Deutsche Gärt. Zeit. 25: 474. f. 6, No. 2; Meehans' Monthly 9: pl. 3, as *Echinocactus whipplei;* Gartenwelt 1: 89, as *Echinocactus glaucus.*

Plate XVI, figure 2, shows the plant collected by Dr. P. A. Rydberg in 1911 at Moab, Utah, which flowered in the New York Botanical Garden in April 1912.

2. Sclerocactus polyancistrus (Engelmann and Bigelow).

Echinocactus polyancistrus Engelmann and Bigelow in Engelmann, Proc. Amer. Acad. 3: 272. 1856.

Simple, globular to oblong, 1 to 4 dm. high; ribs 13 to 17, 1 to 1.5 cm. high, obtuse, strongly undulate; areoles 1 to 1.5 cm. apart; spines about 20; radial spines acicular, white, 1 to 2.5 cm. long; central spines several, rather unequal, up to 12.5 cm. long, the upper ones erect, white, flattened, the others brown, spreading, terete and often hooked; flowers magenta-colored, nearly 8 cm. long, and perhaps as broad; inner perianth-segments oblong, about 4 cm. long; throat of flower broad,

covered with stamens; tube-proper very short, 1 to 2 mm. long; style longer than the stamens, stout, glabrous; stigma-lobes about 8, 4 mm. long; scales on the base of the flower-tube large, obtuse, on the ovary scattered, minute, 1 to 2 mm. long; fruit at first bright magenta, with fleshy walls, but becoming dry and thin-walled, oblong to pyriform, almost destitute of scales, 3.5 to 4 cm. long, dehiscing by a large basal pore; seeds large, 4 mm. long, black, tuberculate; hilum sublateral, large.

Type locality: At the head of the Mojave River, California.

Distribution: Deserts of California and Nevada; reported from western Arizona.

Engelmann in his original description states that the flowers are yellow, as Schumann also states, while Coulter describes them as yellow or red. In our description based on several collections we describe the flowers as magenta. In order to clear up the matter we wrote to Mr. E. C. Rost, a very keen observer, who had recently had this plant under observation; he replied under date of September 2, 1921, as follows:

"In regard to the flowers of *E. polyancistrus*, I will say that I have seen *many* of these plants in blossom. My own color notes record the flower as having petals of a pure transparent 'madder-lake'; stamens bright yellow; pistil crimson. The mature buds are the shade of burnt sienna, or

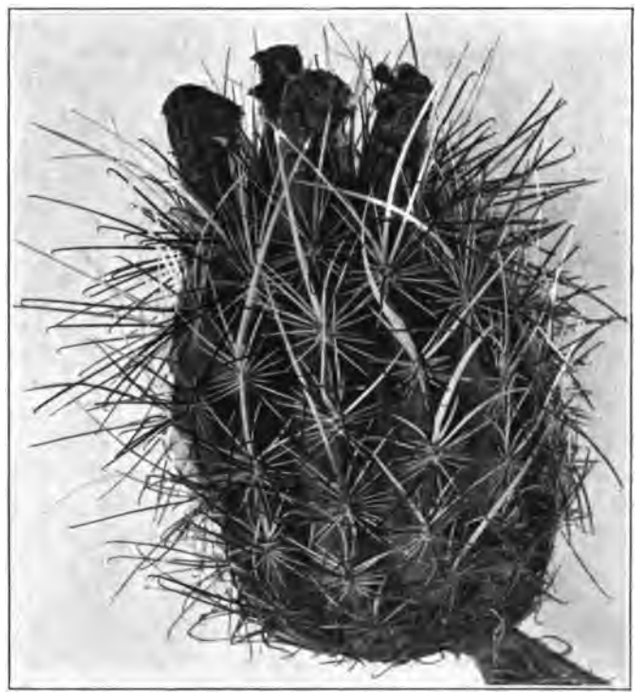


FIG. 224.—Sclerocactus polyancistrus.

brownish red. These flowers, however, could be described as both purple and red, for on their first day of bloom they are 'purple' (madder-lake), while on the second day—and even more so on the third day—they would popularly be termed 'red.' A yellow *polyancistrus* I have never seen, although the bright-yellow stamens sometimes protrude from the blossom in such a manner that a person—at a distance—might think he saw a yellow flower.

"I have never found the *polyancistrus* growing in a dense colony, but have always seen the plants widely scattered, then for miles not a plant, and again a few growing here and there, rather far apart. I have found them in various different localities."

This species, while found over a large area, is said never to be abundant and is found chiefly on the mesas.

Illustrations: Pac. R. Rep. 4: pl. 2, f. 1, 2; Cact. Journ. 1: pl. V, in part; Monatsschr. Kakteenk. 20: 131; 31: 21, as *Echinocactus polyancistrus*.

Plate XXIII, figure 3, shows a fruit and figure 4 a seed from a specimen collected by Ivar Tidestrom in Goldfield, Nevada, June 1919. Figure 224 shows the plant from which the fruit and seed were obtained.

28. UTAHIA gen. nov.

A small globose cactus, prominently ribbed, the ribs tubercled, the areoles felted and bearing several subulate spines; flowers small, nearly rotate, yellow, borne at the areoles of the upper part of the plant; ovary and perianth-tube densely covered with dry imbricated fimbriate-lacerate scales; perianth-segments short, narrow.

Type species: *Echinocactus sileri* Engelmann.

Named with reference to its type locality in the state of Utah. A monotypic genus.

1. Utahia sileri (Engelmann).

Echinocactus sileri Engelmann in Coulter, Contr. U. S. Nat. Herb. 3: 376. 1896.

Globose, 10 cm. in diameter; ribs 13 to 16, prominent, densely crowded, with short rhombic-angled tubercles; radial spines 11 to 15, stiff, white; central spines 3 or 4, black with pale base, most of them curved upward, 18 mm. long, the upper one slightly longer, the lower ones sometimes stouter and porrect; flowers scarcely 2.5 cm. long; fruit unknown.

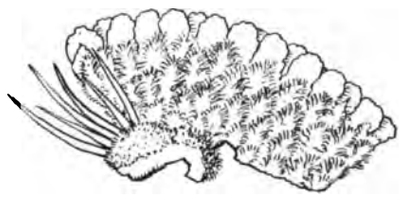


FIG. 225.

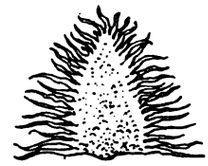


FIG. 226.

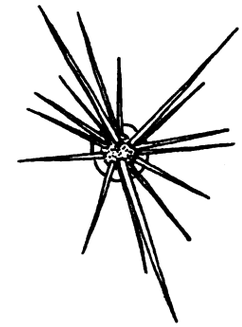


FIG. 227.

FIG. 225.—Flower o. Utahia sileri. x 1.5.
FIG. 226.—Flower-scale of Utahia sileri. x 6.
FIG. 227.—Spine-cluster of Utahia sileri. Natural size.

Type locality: Cottonwood Springs and Pipe Springs, southern Utah.

Distribution: Southern Utah.

Through the kindness of Dr. J. M. Greenman, we have studied the type specimen of this rare plant, preserved in the herbarium of the Missouri Botanical Garden. Flowers, of some other cactus have been erroneously identified as of this species in other collections, but so far as we are aware this plant is known only from the type specimen.

Illustration: Schumann, Gesamtb. Kakteen f. 61, A, as *Echinocactus sileri*.

Figure 225 shows the outside of a flower cut on one side and spread out; it also shows the origin of the flower at the young spine-areole; figure 226 shows a flower-scale, enlarged; figure 227 shows a spine-cluster.

Subtribe 5. CACTANAE.

One-jointed plants, usually stout, globose to oblong, either solitary or cespitose, terrestrial; ribs usually straight, their areoles nearly or always spine-bearing; the flower-bearing areoles forming a terminal cephalium composed of a central woody core surrounded by a dense mass of long wool, bristles or both, often elongated; flowers regular, salverform or funnelform, opening in the afternoon or at night; fruit a small naked berry; seeds small.

We recognize two genera, which are not very closely related.

KEY TO GENERA.

Flowers large, white or rose, night-blooming, the limb of many segments..... 1. *Discocactus*
Flowers small, rose or pinkish, opening in the late afternoon, the limb of few or several segments.. 2. *Cactus*

1. DISCOCACTUS Pfeiffer, Allg. Gartenz. 5: 241. 1837.

Plants rather small, globose or flattened, ribbed; ribs rather low, tubercled; spines borne at the areoles in clusters, more or less curved; flowers from the center of the plant, appearing from a cephalium similar to, but usually not so prominent as, that of *Cactus* (*Melocactus*); flowers rather large for the plants, opening at night, with a definite tube, the limb broad, composed of many segments, usually white or pinkish; fruit small, naked; seeds black, roughened.

FIG. 228.—Discocactus subnudus.

FIG. 229.—Discocactus alteolens.

Discocactus was made a subgenus of *Echinocactus* by Schumann. It is a valid genus, however, confined to eastern South America, although one of the species was originally described, in error, as coming from the West Indies. It is characterized by its plant body, by its cephalium, by its naked fruits, all these suggesting *Cactus*, and by its flowers which open at night and become limp by the next morning.

Three species were described by Pfeiffer, of which the first, *Discocactus insignis*, is the type, but these were afterwards combined into *D. placentiformis*. Three other described species we believe belong here, only one heretofore referred to *Discocactus*, the other two having been described under *Echinocactus* and *Malacocarpus* respectively. Three more are here added.

The generic name is from δίσκος disk, and κάκτος, referring to the flattened, disk-like shape of the plant body.

KEY TO SPECIES.

Plant-body spineless or nearly so..... 1. *D. subnudus*
Plant-body very spiny.
Cephalium composed of long wool and many erect bristles.
Ribs 12 to 16; perianth-segments acute..... 2. *D. hartmannii*
Ribs 9 to 11; perianth-segments so far as known obtuse.
Ribs made up of large tubercles..... 3. *D. heptacanthus*
Ribs made up of indistinct tubercles..... 4. *D. alteolens*
Cephalium with few bristles or none.
Spines acicular..... 5. *D. zehntneri*
Spines stout.
Spines flattened..... 6. *D. placentiformis*
Spines terete..... 7. *D. bahiensis*

1. Discocactus subnudus sp. nov.

Plant simple; ribs few (perhaps 8 or 9), somewhat flattened, divided into tubercles, spineless or nearly so; cephalium small, containing many erect bristles; flowers large.

This species, according to Dr. Albert Löfgren, is to be found in the sands along the coast at Bahia, Brazil, but, unfortunately, Dr. Rose did not find it while he was there in 1915, although he searched for it repeatedly. Dr. Löfgren has furnished us, however, a very characteristic photograph from which the above description is drawn.

Figure 228 is from a photograph taken by Dr. Löfgren.

FIG. 230.—Discocactus hartmannii.

FIG. 231.—Cactus broadwayi.

2. Discocactus hartmannii (Schumann).

Echinocactus hartmannii Schumann, Monatsschr. Kakteenk. 10: 170. 1900.

Plants simple, broader than high, green, shining, crowned by a brown bristly cephalium; ribs 12 to 16, broad at base, obtuse, divided transversely into large tubercles; spines yellow, subulate; radial spines 6 to 12, curved backward and appressed; central spines solitary; flower-tube funnelform, bearing a few spreading scales; outer perianth-segments green; inner perianth-segments lanceolate to nearly oblong, white; fruit yellow, thin-skinned; seeds globular, 2 mm. in diameter.

Type Locality: Campos am Capivary, Paraguay.

Distribution: Paraguay.

The plant is known to us from description and illustrations only.

Illustrations: Blühende Kakteen 2: pl. 69; Schumann, Gesamtb. Kakteen Nachtr. f. 12, 13; Monatsschr. Kakteenk. 10: 171; 11: 184, as *Echinocactus hartmannii*.

Figure 230 is a reproduction of the first illustration cited above.

3. Discocactus heptacanthus (Rodrigues).

Malacocarpus heptacanthus Rodrigues, Pl. Mattogr. 29. 1898.

Globose or slightly depressed, usually solitary, 8 to 10 cm. in diameter; ribs 10 or 11, very broad, broken up into a few large, rounded tubercles; areoles circular, at first tomentose; spines usually 7, all radial, stout, recurved; cephalium small but definite, white, containing many erect bristles; flowers and fruit unknown.

Type locality: Serra da Chapada, near Cuyabá, Matto-Grosso, Brazil.

Distribution: Known only from the type locality.

Schumann in his Nachträge referred this to *Echinocactus alteolens*, but it is certainly different from that species. We have not seen the type of this species, which has not been preserved; but we have seen Mr. F. C. Hoehne's specimen, which came from Rodrigues's locality, Cuyabá, Matto-Grosso, and we have a photograph of it.

Illustration: Rodrigues, Pl. Mattogr. pl. 11, as *Malacocarpus heptacanthus*.

Figure 232 is a copy of the illustration cited above.

4. Discocactus alteolens Lemaire in Dietrich, Allg. Gartenz. **14**: 202. 1846.

Discocactus tricornis Monville in Pfeiffer, Abbild. Beschr. Cact. **2**: pl. 28. 1846–1850.
Echinocactus alteolens Schumann in Martius, Fl. Bras. 4^2: 246. 1890.
Cactus alteolens Kuntze, Deutsch. Bot. Monatsschr. **21**: 173. 1903.

Plant solitary, broader than high, dull gray, crowned by a broad cephalium; ribs 9 or 10, broad at base, low; radial spines 5 or 6, the 3 upper ones very short, ascending; central spines none or rarely

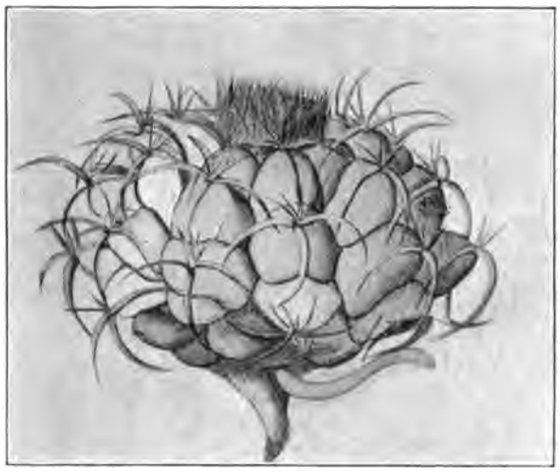


FIG. 232.—Discocactus heptacanthus.

FIG. 233.—Discocactus placentiformis.

solitary and porrect; flowers salverform; tube slender, bearing slender scales with naked axils; inner perianth-segments white, numerous, obtuse; ovary naked, glabrous.

Type locality: Not cited.

Distribution: Doubtless eastern central Brazil.

This species is known to us from description and illustration only.

Echinocactus tricornis Monville is given by A. Dietrich (Allg. Gartenz. **14**: 203. 1846) as a synonym.

Illustration: Pfeiffer, Abbild. Beschr. Cact. **2**: pl. 28, as *Discocactus tricornis*.

Figure 229 is a reproduction of the illustration here cited.

5. Discocactus zehntneri sp. nov.

Small globose plants, 5 to 7 cm. in diameter, entirely covered by the numerous interlocking spines; spines 12 to 14 in a cluster, gray to nearly white at least when old, slender, acicular, curved backward, 1.5 to 2.5 cm. long; central spine usually solitary, similar to the radials; cephalium small, made

up of long soft wool and few bristles if any; flowers about 3 cm. long, 4 cm. broad when fully expanded; inner perianth-segments numerous, white, acute; fruit a small naked red clavate berry, 2.5 cm. long; seeds globular, tuberculate.

The material upon which this species is based was obtained from Dr. Leo Zehntner, who procured it at Sentocé, Bahia, Brazil. A box of living material, fruit, seeds, and several photographs of flowering plants were contributed by him. It is a very distinct species.

6. Discocactus placentiformis (Lehmann) Schumann in Engler and Prantl, Pflanzenfam. 3^{6a}: 190. 1894.

Cactus placentiformis Lehmann, Delect. Sem. Hamb. 1826.
Melocactus besleri Link and Otto, Verh. Ver. Beförd. Gartenb. 3: 420. 1827.
Melocactus placentiformis De Candolle, Prodr. 3: 460. 1828.
Discocactus insignis Pfeiffer, Allg. Gartenz. 5: 241. 1837.
Discocactus lehmannii Pfeiffer, Nov. Act. Nat. Cur. 19: 120. 1839.
Discocactus linkii Pfeiffer, Nov. Act. Nat. Cur. 19: 120. 1839.
Echinocactus placentiformis Schumann, Fl. Bras. 4^3: 246. 1890.
Discocactus besleri Weber, Dict. Hort. Bois 450. 1896.

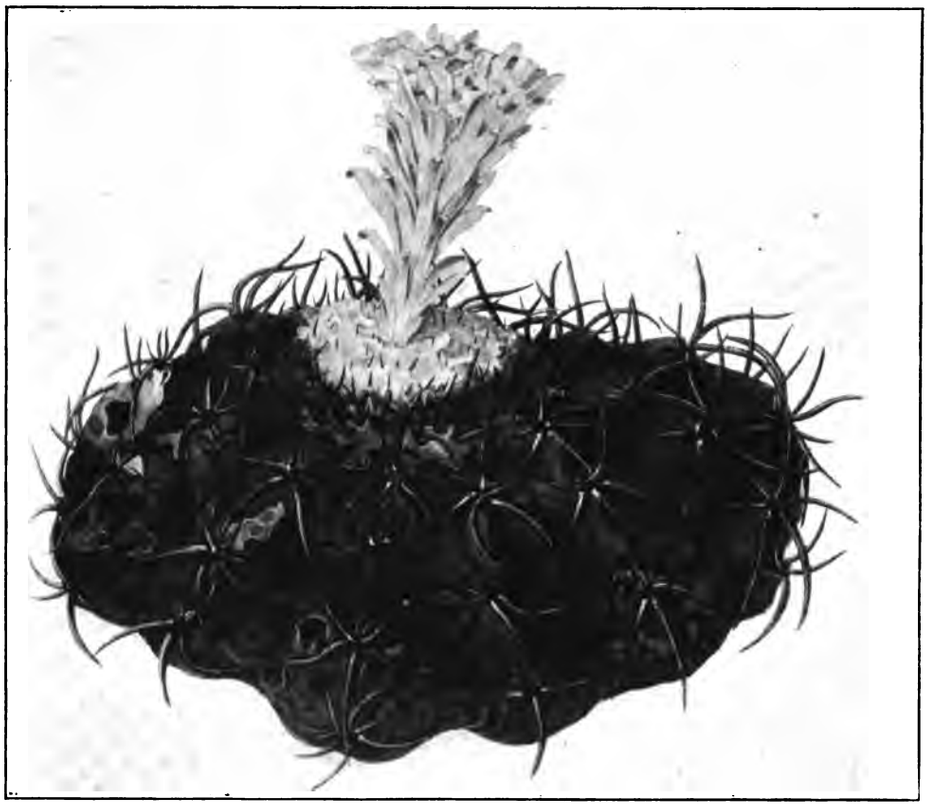


FIG. 234.—Discocactus placentiformis.

Plant broad and low, solitary, blue-green; ribs 10 to 14, broad and low; areoles 6 or 7 on each rib; radial spines dark, flattened (?), 6 or 7, stout, more or less recurved; central spine usually wanting, sometimes solitary and porrect; flowers large; outer perianth-segments rose-colored; inner perianth-segments white, acute; fruit white, globular, juicy.

Type locality: Brazil, but no definite locality cited.
Distribution: Brazil.

This species was figured by Besler in 1613 and Besler's figure was afterwards made the type of *Melocactus besleri.*

Mammillaria besleri is credited by the Index Kewensis to Link and Otto in Rümpler (Förster, Handb. Cact. ed. 2. 1020. 1885) which is the index of that work where the name *Melocactus besleri* is intended.

We have referred to this species the plant collected by Dr. Rose at Joazeiro, Bahia, in 1915 (No. 19764), although we are not quite certain of this reference. Dr. Rose found the plant on the dry mesa east of the town. It is deep-seated in the hard ground and appears only a little above the surface. Old plants produce a large white-woolly cephalium from near the center of which the flowers appear. Birds are said to be very fond of the fruit of this plant.

Illustrations: Nov. Act. Nat. Cur. 16[1]: pl. 16, as *Cactus placentiformis;* Nov. Act. Nat. Cur. 18: Suppl. 1. pl. 4, f. 2; Verh. Kon. Akad. Wetensch. II. 5[3]: pl. 1, f. 2, 2a, 2b; Verh. Ver. Beförd. Gartenb. 3: pl. 21, as *Melocactus besleri;* Krook, Handb. Cact. 63; Nov. Act. Nat. Cur. 19: Suppl. 1. pl. 15; Palmer, Cult. Cact. 127; Förster, Handb. Cact. ed. 2. 449. f. 51; Pfeiffer, Abbild. Beschr. Cact. 2: pl. 1, as *Discocactus insignis;* Besler, Hort. Eystett. 4. Ord. f. 1, as *Melocactus;* Engler and Prantl, Pflanzenfam. 3[6a]: f. 64.

Figure 234 is a reproduction of the first illustration cited above; figure 233 is from a photograph, taken by Paul G. Russell, of Dr. Rose's plant at Joazeiro, Brazil.

7. Discocactus bahiensis sp. nov.

Small, about 6 cm. in diameter, somewhat flattened; ribs about 10, but nearly hidden under the mass of spines; cephalium prominent, made up of a mass of white wool, almost devoid of bristles; spines 7 to 9, slightly flattened, stout, somewhat curved backward, rose-colored, 1.5 to 3 cm. long; flowers 4 to 5 cm. long with a slender tube; perianth-segments oblong, white, tinged with yellow; fruit a small naked berry; seeds globular, tuberculate.

Obtained by Dr. J. N. Rose through Dr. Leo Zehntner near Joazeiro, Bahia, Brazil (Rose's No. 19783, type, and No. 19742).

Somewhat similar to *D. zehntneri* in size, but with different spines, a more prominent cephalium, and coarser tuberculations on the seeds.

Plate XXIV, figure 4, shows the type which flowered in the New York Botanical Garden in April 1916.

2. CACTUS Linnaeus, Sp. Pl. 466. 1753.

Melocactus Link and Otto, Verh. Ver. Beförd. Gartenb. 3: 417. 1827.

Plants solitary or clustered, globular to short-cylindric, sometimes depressed, at least when young, 1-jointed, bearing clusters of spines on the ribs; ribs 9 to 20, mostly straight, rarely spiraled in some individuals; inflorescence a compact mass of hairs and bristles forming a cephalium borne at the top of the plant, this often very large and elongated; flowers small, pinkish, appearing in the mid-afternoon from the top of the cephalium, tubular-salverform, the few perianth-segments spreading; stamens attached near the top of the slender flower-tube; style slender; stigma-lobes linear, few; fruit clavate, naked, red or rarely white; seeds black.

Type species: *Cactus melocactus* Linnaeus.

The terminal cephalium is a woody axis, the wood-elements arranged in interlocking spirals, showing a characteristic, complicated pattern, in cross-section, well illustrated in that of *Cactus intortus;* on this axis the flower-bearing areoles are densely aggregated, spineless, but woolly and often bristly.

The fruits in this genus are very much alike in shape, varying from white to scarlet, always smooth, naked, and of an agreeable acid taste. They are often eaten in the West Indies being slightly juicy when first ripe.

About 224 names occur under *Melocactus* and 282 under *Cactus;* many of the latter, however, are referable to other genera. We recognize 18 species in the genus *Cactus* as here circumscribed.

Plants of this genus were among the earliest cacti known to Europeans, by whom they were first called *Echinomelocactus*. Tournefort shortened the name to *Melocactus* and Linnaeus again shortened it to *Cactus*. Under this name these plants generally passed until 1827 when Link and Otto restored the name *Melocactus*.

At the time that Linnaeus wrote his Species Plantarum only one species of this genus, as we now understand it, was known, although Linnaeus included with it all the other members of the family; this he called *Cactus melocactus*. Under this name, however, were included several species. For instance, we know that the plants described and figured by Bradley came from Nevis and St. Christopher and are different from the Jamaican species. Philip Miller in his Gardeners' Dictionary, published in 1768, described five species in the genus *Cactus*, but only the first two (*C. melocactus* and *C. intortus*) belong to the genus as now delimited.

These plants have various common names, but the ones most generally known among English speaking people are Turk's cap or Turk's head. In Brazil they are called cabeça de frade; in Cuba and Porto Rico, melones.

The name *Cactus* is of Greek origin, meaning thistle, with reference to the spiny armament, but, as here used, comes directly from *Melocactus*, that name having been shortened by Linnaeus.

The species of *Cactus* have a wide distribution; none of them reaches the continental United States, but one inhabits Porto Rico and the Virgin Islands. Hemsley (Biol. Centr. Amer. Bot. 1: 502) lists four species of *Melocactus* (*M. curvispinus*, *M. delessertianus*, *M. ferox*, and *M. mammillariaeformis*) from Mexico, some of which may belong to this genus, but the last one, however, must be referred elsewhere. We have seen only a barren Mexican plant, but Dr. C. A. Purpus has reported a species from Tehuantepec. *M. salvador* Murillo, from near Jalapa, was published a few years ago; photographs of this plant are at Kew. One species (*Cactus maxonii*) is known from Guatemala; we have this in cultivation. One species (*Cactus ruestii*) is known from Honduras; this we have seen. No species have been reported from the other Central American countries, including Panama.

Three species have been reported from Colombia (*M. amoenus*, *M. rubens*, and *M. obtusipetalus*). *M. obtusipetalus* is reported from near Bogotá, which is a very unusual habitat. We have seen two species from Colombia, one obtained by Mr. Pittier in the Cauca Valley and the other brought from Santa Marta by Mr. Curran. No species have been found in Ecuador or Chile, but one is known from the foothills of central Peru. No species are known from Bolivia, Argentina, Uruguay, or Paraguay. In central and northern Brazil, especially along the coast and in the desert regions of the interior, several species occur. Our collections indicate four species, although some 14 names, based on Brazilian material, have been published. We have seen no specimens from any of the Guianas, although a species has been reported recently from Dutch Guiana and is shown in one of our illustrations (fig. 245). Four species have been reported from Venezuela (*M. caesius*, *M. griseus*, *M. lehmannii*, and *M. cephalenoplus*). We have seen one or two species from Venezuela.

These plants are very common in the West Indies. We have collected them ourselves on the four larger islands and many of the smaller ones. Two species have been reported from Cuba (*Cactus harlowii* and *Melocactus havannensis*), one from Jamaica (*M. communis* or *C. melocactus*), and several species from Santo Domingo, but we know only one from Porto Rico. We also know one from St. Thomas, St. Croix, St. Christopher, and Antigua respectively, while Boldingh reports one species on St. Eustatius, Saba, and St. Martin respectively. We have seen a plant from Tobago but this is not referable to any species known to us. The genus is found also on Curaçao, Bonaire, and Aruba, and many names have been given to what seems to represent a single species on those islands.

Because of the interest in the species they have been much planted in tropical America.

KEY TO SPECIES.

A. Radial spines acicular, appressed, very unlike the central ones; species of Curaçao, Aruba, and Bonaire ..... 1. *C. macracanthus*
AA. Radial spines subulate, spreading, or diverging.
B. Flowers 3 to 4 cm. long; fruit 5 to 6 cm. long; species of Jamaica ..... 2. *C. melocactus*
BB. Flowers 2.5 cm. long or less; fruit 1 to 2 cm. long.
C. Spines all very stout; species of Hispaniola ..... 3. *C. lemairei*
CC. Spines relatively slender.
D. Spines flexible, greatly elongated; species of Brazil ..... 4. *C. oreas*
DD. Spines stiff, not greatly elongated.
E. Central American and Mexican species.
Spines up to 3 cm. long ..... 5. *C. ruestii*
Spines shorter.
Central spines about as long as the radial ones ..... 6. *C. maxonii*
Central spines twice as long as the radials or longer ..... 7. *C. salvador*
EE. West Indian species.
Radial spines very slender, widely spreading, slightly curved ..... 8. *C. broadwayi*
Radial spines stouter, divergent, straight or nearly so.
Ribs thick; plants up to 4 dm. in diameter ..... 9. *C. intortus*
Ribs thinner; plants 1 to 1.5 dm. in diameter ..... 10. *C. harlowii*
EEE. South American species.
Spines white, at least when young.
Spines curved; species of Colombia.
Flowers 1 cm. wide or less ..... 11. *C. amoenus*
Flowers 2.5 cm. wide ..... 12. *C. obtusipetalus*
Spines straight; species of Venezuela and Patos Island, Trinidad ..... 13. *C. caesius*
Spines gray, brown or reddish.
Spines dark brown; species of Peru ..... 14. *C. townsendii*
Spines gray to reddish; species of Brazil.
Spines straight, up to 3 cm. long ..... 15. *C. bahiensis*
Spines curved, shorter.
Berry white or pale pink ..... 16. *C. melocactoides*
Berry red to carmine.
Spines very stiff, curved backward ..... 17. *C. zehntneri*
Spines slender, curved upward ..... 18. *C. neryi*

1. Cactus macracanthus* Salm-Dyck, Observ. Bot. 1: 3. 1820.

Cactus pyramidalis Salm-Dyck, Observ. Bot. 1: 4. 1820.
Melocactus macracanthus Link and Otto, Verh. Ver. Beförd. Gartenb. 3: 418. 1827.
Melocactus pyramidalis Link and Otto, Verh. Ver. Beförd. Gartenb. 3: 419. 1827.
Echinocactus salmianus Link and Otto, Verh. Ver. Beförd. Gartenb. 3: 423. 1827.
Melocactus salmianus Link and Otto, Verh. Ver. Beförd. Gartenb. 3: pl. 13. 1827.
Melocactus spatangus Pfeiffer, Enum. Cact. 45. 1837.
Melocactus lehmanni Miquel, Linnaea 11: 642. 1837.
Melocactus zuccarinii Miquel, Linnaea 11: 645. 1837.
Melocactus microcephalus Miquel, Nov. Act. Nat. Cur. 18: Suppl. 1. 156. 1841.
Melocactus pyramidalis carneus Miquel, Nov. Act. Nat. Cur. 18: Suppl. 1. 166. 1841.
Melocactus parvispinus Suringar, Versl. Med. Akad. Wetensch. III. 2: 183. 1886. Not De Candolle, 1828.
Melocactus koolwijckianus Suringar, Versl. Med. Akad. Wetensch. III. 2: 184. 1886.
Melocactus rubellus Suringar, Versl. Med. Akad. Wetensch. III. 2: 184. 1886.
Melocactus stramineus Suringar, Versl. Med. Akad. Wetensch. III. 2: 185, 186. 1886.
Melocactus (rubellus) ferox Suringar, Versl. Med. Akad. Wetensch. III. 2: 185. 1886. Not Pfeiffer, 1837.
Melocactus (rubellus) hexacanthus Suringar, Versl. Med. Akad. Wetensch. III. 2: 185. 1886.
Melocactus (stramineus ?) trichacanthus Suringar, Versl. Med. Akad. Wetensch. III. 2: 186. 1886.
Melocactus reversus Suringar, Versl. Med. Akad. Wetensch. III. 2: 187. 1886.
Melocactus retiusculus Suringar, Versl. Med. Akad. Wetensch. III. 2: 187. 1886.
Melocactus angusticostatus Suringar, Versl. Med. Akad. Wetensch. Amst. III. 2: 188. 1886.
Melocactus retiusculus angusticostatus Suringar, Versl. Med. Akad. Wetensch. III. 2: 188. 1886.
Melocactus approximatus Suringar, Versl. Med. Akad. Wetensch. III. 2: 189. 1886.
Melocactus evertszianus Suringar, Versl. Med. Akad. Wetensch. III. 2: 190. 1886.
Melocactus patens Suringar, Versl. Med. Akad. Wetensch. III. 2: 190. 1886.
Melocactus cornutus Suringar, Versl. Med. Akad. Wetensch. III. 2: 191. 1886.
Melocactus intermedius Suringar, Versl. Med. Akad. Wetensch. III. 2: 192. 1886.
Melocactus pusillus Suringar, Versl. Med. Akad. Wetensch. III. 2: 192. 1886.
Melocactus spatanginus Suringar, Versl. Med. Akad. Wetensch. III. 2: 193. 1886.
Melocactus koolwijkianus adustus Suringar, Versl. Med. Akad. Wetensch. III. 6: 438. 1889.
Melocactus argenteus Suringar, Versl. Med. Akad. Wetensch. III. 6: 439. 1889.
Melocactus argenteus tenuispinus Suringar, Versl. Med. Akad. Wetensch. III. 6: 439. 1889.
Melocactus roseus Suringar, Versl. Med. Akad. Wetensch. III. 6: 439. 1889.
Melocactus limis Suringar, Versl. Med. Akad. Wetensch. III. 6: 440. 1889.
Melocactus obliquus Suringar, Versl. Med. Akad. Wetensch. III. 6: 440. 1889.
Melocactus flexus Suringar, Versl. Med. Akad. Wetensch. III. 6: 441. 1889.
Melocactus incurvus Suringar, Versl. Med. Akad. Wetensch. III. 6: 441. 1889.
Melocactus nanus Suringar, Versl. Med. Akad. Wetensch. III. 6: 441. 1889.
Melocactus rudis Suringar, Versl. Med. Akad. Wetensch. III. 6: 442. 1889.

*This name was originally spelled *Cactus macrocanthos* by Salm-Dyck.

Melocactus capillaris Suringar, Versl. Med. Akad. Wetensch. III. 6: 442. 1889.
Melocactus extensus Suringar, Versl. Med. Akad. Wetensch. III. 6: 442. 1889.
Melocactus martialis Suringar, Versl. Med. Akad. Wetensch. III. 6: 443. 1889.
Melocactus compactus Suringar, Versl. Med. Akad. Wetensch. III. 6: 444. 1889.
Melocactus ferus Suringar, Versl. Med. Akad. Wetensch. III. 6: 444. 1889.
Melocactus (*radiatus*) *contortus* Suringar, Versl. Med. Akad. Wetensch. III. 6: 445. 1889.
Melocactus pentacanthus Suringar, Versl. Med. Akad. Wetensch. III. 6: 445. 1889.
Melocactus radiatus Suringar, Versl. Med. Akad. Wetensch. III. 6: 446. 1889.
Melocactus albispinus Suringar, Versl. Med. Akad. Wetensch. III. 6: 446. 1889.
Melocactus eburneus Suringar, Versl. Med. Akad. Wetensch. III. 6: 447. 1889.
Melocactus euryacanthus Suringar, Versl. Med. Akad. Wetensch. III. 6: 447. 1889.
Melocactus baarsianus Suringar, Versl. Med. Akad. Wetensch. III. 6: 448. 1889.
Melocactus uncinatus Suringar, Versl. Med. Akad. Wetensch. III. 6: 450. 1889.
Melocactus arcuatus Suringar, Versl. Med. Akad. Wetensch. III. 6: 450. 1889.
Melocactus elongatus Suringar, Versl. Med. Akad. Wetensch. III. 6: 451. 1889.
Melocactus (*stellatus* ?) *sordidus* Suringar, Versl. Med. Akad. Wetensch. III. 6: 451. 1889.
Melocactus stellatus Suringar, Versl. Med. Akad. Wetensch. III. 6: 452. 1889.
Melocactus obovatus Suringar, Versl. Med. Akad. Wetensch. III. 6: 453. 1889.
Melocactus (*stellatus*) *flavispinus* Suringar, Versl. Med. Akad. Wetensch. III. 6: 453. 1889.
Melocactus flexilis Suringar, Versl. Med. Akad. Wetensch. III. 6: 453. 1889.
Melocactus reticulatus Suringar, Versl. Med. Akad. Wetensch. III. 6: 453. 1889.
Melocactus (*stellatus*) *inflatus* Suringar, Versl. Med. Akad. Wetensch. III. 6: 454. 1889.
Melocactus (*stellatus*) *dilatatus* Suringar, Versl. Med. Akad. Wetensch. III. 6: 454. 1889.
Melocactus leucacanthus Suringar, Versl. Med. Akad. Wetensch. III. 6: 454. 1889.
Melocactus trachycephalus Suringar, Versl. Med. Akad. Wetensch. III. 6: 455. 1889.
Melocactus trigonus Suringar, Versl. Med. Akad. Wetensch. III. 6: 456. 1889.
Melocactus ovatus Suringar, Versl. Med. Akad. Wetensch. III. 6: 456. 1889.
Melocactus flammeus Suringar, Versl. Med. Akad. Wetensch. III. 6: 457. 1889.
Melocactus pulvinosus Suringar, Versl. Med. Akad. Wetensch. III. 6: 458. 1889.
Melocactus armatus Suringar, Versl. Med. Akad. Wetensch. III. 6: 458. 1889.
Melocactus salmianus adauctus Suringar, Versl. Med. Akad. Wetensch. III. 6: 460. 1889.
Melocactus salmianus contractus Suringar, Versl. Med. Akad. Wetensch. III. 6: 461. 1889.
Melocactus salmianus aciculosus Suringar, Versl. Kon. Akad. Wetensch. 6: 187. 1897.
Melocactus rotifer Suringar, Versl. Kon. Akad. Wetensch. Amst. 6: 188. 1897.
Melocactus exsertus Suringar, Versl. Kon. Akad. Wetensch. 6: 189. 1897.
Melocactus grollianus Suringar, Versl. Kon. Akad. Wetensch. 6: 190. 1897.
Melocactus pyramidalis pumilus Suringar, Versl. Kon. Akad. Wetensch. 6: 191. 1897.
Melocactus rotatus Suringar, Versl. Kon. Akad. Wetensch. 6: 191. 1897.
Melocactus bargei Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 8: 9. 1901.
Melocactus pinguis Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 8: 11. 1901.
Melocactus intermedius laticostatus Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 8: 15. 1901.
Melocactus intermedius tenuispinus Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 8: 17. 1901.
Melocactus firmus Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 8: 17. 1901.
Melocactus inversus Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 8: 19. 1901.
Melocactus appropinquatus Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 8: 19. 1901.
Melocactus salmianus spectabilis Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 8: 22. 1901.
Melocactus aciculos J. V. Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 8: 23. 1901.
Melocactus gilvispinus Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 8: 28. 1901.
Melocactus gilvispinus planispinus Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 8: 30. 1901.
Melocactus aciculosus adauctus J. V. Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 8: 33. 1901.
Melocactus pyramidalis costis-angustioribus J. V. Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 8: 35. 1901.
Melocactus buysianus Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 8: 38. 1901.
Melocactus microcarpus Suringar in J. V. Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 16^2: 3. 1910.
Melocactus trigonaster Suringar in J. V. Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 16^2: 4. 1910.
Melocactus pyramidalis compressus Suringar in J. V. Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 16^2: 4. 1910.
Melocactus cordatus J. V. Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 16^2: 5. 1910.
Melocactus tenuissimus J. V. Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 16^2: 6. 1910.
Melocactus pinguis areolosus J. V. Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 16^2: 7. 1910.
Melocactus rotula angusticostatus J. V. Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 16^2: 8. 1910.
Melocactus intermedius rotundatus J. V. Suringar, Verh. K9n. Akad. Wetensch. Amst. II. 16^2: 9. 1910.
Melocactus rotula validispinus J. V. Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 16^2: 10. 1910.
Melocactus grandis J. V. Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 16: 11. 1910.
Melocactus grandispinus J. V. Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 16^2: 12. 1910.
Melocactus lutescens J. V. Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 16^2: 13. 1910.
Melocactus rotifer angustior J. V. Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 16^2: 14. 1910.
Melocactus pinguis planispinus J. V. Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 16^2: 15. 1910.
Melocactus gracilis J. V. Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 16^2: 16. 1910.
Melocactus microcephalus olivascens J. V. Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 16^2: 17. 1910.
Melocactus cylindricus J. V. Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 16^2: 19. 1910.
Melocactus pinguis laticostatus J. V. Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 16^2: 19. 1910.
Melocactus pinguis tenuissimus J. V. Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 16^2: 20. 1910.

Plants pale green or dull green, globular or somewhat broader than high, often 3 dm. in diameter and in time crowned by a cephalium; cephalium elongated, becoming 2 dm. high or more, 1 dm. in

diameter, composed of white felt and brown bristles longer than the felt; ribs 11 to 15, broad at base, rounded; spines all brown to yellow at first; radial spines 12 to 15, acicular, widely spreading, 3 cm. long or more; central spines usually 4 but sometimes more, subulate, much stouter than the radials, unequal in length, sometimes 7 cm. long; flower, including the ovary, about 2 cm. long, swollen at the base, the segments linear-lanceolate, acutish, about 5 mm. long; fruit broadly clavate, shining, 1.5 to 2 cm. long, capped by the more or less persistent perianth; seeds short-oblong, 1 mm. long, dull black.

Type locality: Not cited.

Distribution: Curaçao and the adjacent Dutch Islands.

Dr. Britton, while studying the vegetation of Curaçao in 1913 with special relation to the cacti,* closely examined this species at many localities. Many slight variations in size and shape of the plant-body, length and color of the spines, and development of the cephalium were observed, but the conclusion was reached that all the individuals were, doubtless, referable to but one species, notwithstanding Professor Suringar's contrary opinion; Dr. Shafer who accompanied Dr. Britton agreed with this result. Dr. Rose, visiting Curaçao in 1916, arrived at the conclusions reached by Dr. Britton and independently by Dr. I. Boldingh, who studied the vegetation of Bonaire, Curaçao, and Aruba in 1909 and 1910.

The synonymy of the species is the largest of any of the cacti and perhaps not exceeded by that of any other plant.

Illustrations: Verh. Ver. Beförd. Gartenb. 3: pl. 12; Nov. Act. Nat. Cur. 18: Suppl. 1. pl. 4, f. 4; Mus. Bot. Leide 3: pl. 17; 18, C, as *Melocactus macracanthus;* Verh. Ver. Beförd. Gartenb. 3: pl. 13; Mus. Bot. Leide 3: pl. 10, F; Nov. Act. Nat. Cur. 18: Suppl. 1. pl. 4, f. 6, as *Melocactus salmianus;* Mus. Bot. Leide 3: pl. 9, 11, as *Melocactus salmianus* (forma); Mus. Bot. Leide 3: pl. 9, as *Melocactus salmianus trispinus;* Mus. Bot. Leide 3: pl. 11, as *Melocactus salmianus quadrispinus;* Verh. Ver. Beförd. Gartenb. 3: pl. 25; Nov. Act. Nat. Cur. 18: Suppl. 1. pl. 3; pl. 4, f. 5, as *Melocactus pyramidalis;* Nov. Act. Nat. Cur. 18: Suppl. 1. pl. 6, as *Melocactus dichroacanthus;* Nov. Act. Nat. Cur. 18: Suppl. 1. pl. 1. f. 1; pl. 2, f. 1, g, h; f. 2; pl. 4, f. 7; pl. 8; Förster, Handb. Cact. ed. 2. 440. f. 49; Mus. Bot. Leide 3: pl. 16; 18, D, as *Melocactus lehmanni;* Nov. Act. Nat. Cur. 18: Suppl. 1. pl. 1, f. 3; pl. 2, f. 1, a, b, e, f; pl. 9, as *Melocactus microcephalus;* Verh. Kon. Akad. Wetensch. II. 5^3: pl. 1. f. 3, 3a, 3b, as *Melocactus uncinatus;* Verh. Kon. Akad. Wetensch. II. 5^3: pl. 1, f. 4, 4a, 4b, 4c, as *Melocactus arcuatus;* Nov. Act. Nat. Cur. 18: Suppl. 1. pl. 10; Förster, Handb. Cact. ed. 2. 444. f. 50, as *Melocactus zuccarinii;* Mus. Bot. Leide 3: pl. 6, 10, C, as *Melocactus patens*; Mus. Bot. Leide 3: pl. 7, 10, D, as *Melocactus cornutus;* Mus. Bot. Leide 3: pl. 8, 10, E, as *Melocactus pusillus;* Mus. Bot. Leide 3: pl. 10, B, as *Melocactus parvispinus;* Mus. Bot. Leide 3: pl. 14, 18, A, as *Melocactus communiformis;* Mus. Bot. Leide 3: pl. 15, 18, B, as *Melocactus rotula;* Mus. Bot. Leide 3: pl. 18, E; 21, as *Melocactus grollianus;* Mus. Bot. Leide 3: pl. 18, F, 22, as *Melocactus exsertus;* Mus. Bot. Leide 3: pl. 18, G; 23, as *Melocactus spatanginus;* Mus. Bot. Leide 3: pl. 24, as *Melocactus bargei.*

2. Cactus melocactus Linnaeus, Sp. Pl. 466. 1753.

Cactus coronatus Lamarck, Encycl. 1: 537. 1783.
Cactus melocactus communis Aiton, Hort. Kew ed. 2. 3: 175. 1811.
? *Cactus lamarckii* Colla, Mem. Accad. Sci. Torino 33: 127. 1826.
Melocactus meonacanthus Link and Otto, Verh. Ver. Beförd. Gartenb. 3: pl. 15. 1827.
Melocactus communis Link and Otto, Verh. Ver. Beförd. Gartenb. 3: 417. 1827.
Echinocactus meonacanthus Link and Otto, Verh. Ver. Beförd. Gartenb. 3: 428. 1827.
? *Melocactus lamarckii* G. Don, Hist. Dichl. Pl. 3: 160. 1834.
? *Melocactus rubens* Pfeiffer, Enum. Cact. 43. 1837.
? *Melocactus communis laniferus* Pfeiffer, Enum. Cact. 43. 1837.
Echinocactus melocactoides Lemaire, Cact. Aliq. Nov. 28. 1838.
? *Melocactus communis acicularis* Monville in Lemaire. Cact. Gen. Nov. Sp. 103. 1839.
? *Melocactus communis magnisulcatus* Lemaire, Cact. Gen. Nov. Sp. 103. 1839.
Melocactus communis spinosior Monville in Lemaire, Cact. Gen. Nov. Sp. 103. 1839.
Cactus communis Steudel, Nom. ed. 2. 1: 245. 1840.
Cactus meonacanthus Steudel, Nom. ed. 2. 1: 246. 1840.
Melocactus melocactus Karsten, Deutsche Fl. 888. 1882.

*Journ. N. Y. Bot. Gard. 14: 105, 106. 1913.

Short-cylindric, 5 to 10 dm. high; cephalium up to 10 cm. broad, 3 to 5 cm. high, rounded, composed of white wool and long brown bristles or spines, much longer than the wool; ribs 10 or 11, up to 3 dm. in diameter, prominent, 2 to 3 cm. high; spines about 10 to 12, stout, 3 to 5 cm. long, terete, yellowish to brown; flowers 3 to 4 cm. long; the tube narrowly cylindric, the lobes oblong, obtuse or mucronulate; fruit clavate, much elongated, 5 to 6 cm. long; seeds numerous, black, shining.

Type locality: Jamaica.

Distribution: Arid southern parts of Jamaica.

Dr. Britton studied this plant in the Healthshire Hills, south of Spanish Town, Jamaica, in company with Mr. William Harris in 1908. Here it is abundant on limestone with other cacti and xerophytic shrubs and trees and travelers use it for drinking water by cutting off the top and scraping out the watery pulp.

Mammillaria communis (Steudel, Nom. ed. 2. 1: 245. 1840) appeared as a synonym of *Cactus communis.*

Melocactus brongniartii Lemaire (Cact. Aliq. Nov. 12. 1838), of unknown origin, has never been definitely identified. Lemaire states that it is related to *Melocactus communis.*

FIG. 235.—Cactus lemairei.

FIG. 236.—Cactus broadwayi.

Illustrations: Gerarde, Herball ed. 1. 1013; ed. 2 and 3. 1177, as *Melocarduus echinatus;* L. Obel. Kruydboeck 2: 27. (24?) 1581, as *Echinomelocactus;* Abh. Bayer. Akad. Wiss. München 2: pl. 2, f. 10 (?), as *Echinocactus leucacanthus;* Mus. Bot. Leide 3: pl. 14; pl. 18, A, as *M. communiformis;* Mus. Bot. Leide 3: pl. 8; pl. 10, E, as *M. pusillus;* Nov. Act. Nat. Cur. 19[1]: pl. 16, f. 9: Abh. Bayer. Akad. Wiss. München 2: pl. 1, II. f. 3, as *M. rubens;* Nov.Comm. Acad. Scient. 3: pl. 26, as *M. rufispinus;* Thomas, Zimmerkultur Kakteen 43, as *M. brongnartii;* Clusues, Exot. pl. 92; Verh. Ver. Beförd. Gartenb. 3: pl. 15, as *M. meonacanthus;* (?) Mem. Accad. Sci. Torino 33: pl. 7, as *Cactus lamarckii;* Verh. Ver. Beförd. Gartenb. 3: pl. 11; Förster, Handb. Cact. ed. 2. 433. f. 48; Mém. Mus. Hist. Nat. Paris 17: pl. 6; Watson, Cact. Cult. 140. f. 54; ed. 3. f. 33; Balt. Cact. Journ. 1: pl. 30; Cycl. Amer. Hort. Bailey 2: f. 1389; Möllers Deutsche Gärt. Zeit. 25: 477. f. 11, No. 1, 10; Schelle, Handb. Kakteenk. 206. f. 138; Verh. Kon. Akad. Wetensch. II. 5[3]: pl. 2, f. 3; The Garden 64: 337; Ann. Inst. Roy. Hort. Fromont 2: pl. 1, f. C; Garten-Zeitung 4: 182. f. 42, No. 15; Gartenwelt 7: 277;

11: 498; Karsten, Deutsche Fl. 887. f. 501, No. 1; ed. 2. 2: 456. f. 605, No. 1; Dict. Hort. Bois 826. f. 578; Nov. Act. Nat. Cur. 18: Suppl. 1. pl. 1, f. 2; Lemaire, Cactées 29. f. 1; Palmer, Cult. Cact. 105; Rev. Hort. 1857: f. 124, as *Melocactus communis;* Hort. Ripul. App. 3: pl. 7, as *Cactus communis;* Besler, Hort. Eystett. 4. Ord. f. 1; De Candolle, Pl. Succ. 2: pl. 112; De Tussac, Fl. Antill. 2: pl. 27; Loudon, Encycl. Pl. 410. f. 6848; Stand. Cycl. Hort. Bailey 2: 613. f. 731.

3. Cactus lemairei (Monville).

Melocactus communis oblongus Link and Otto, Verh. Ver. Beförd. Gartenb. 3: 418. 1827.
Melocactus communis macrocephalus Link and Otto, Verh. Ver. Beförd. Gartenb. 3: 418. 1827.
Echinocactus intortus purpureus De Candolle, Prodr. 3: 462. 1828.
? *Melocactus communis conicus* Pfeiffer, Enum. Cact. 43. 1837.
*Echinocactus lemarii** Monville in Lemaire, Cact. Aliq. Nov. 17. 1838.
Melocactus crassispinus Salm-Dyck, Allg. Gartenz. 8: 10. 1840.
*Melocactus lemarii** Miquel in Lemaire, Hort. Univ. 1: 286. ~~1839.~~ 1840.
Melocactus hispaniolicus Vaupel, Monatsschr. Kakteenk. 29: 121. 1919.

Plant usually rather slender, 2 to 3 dm. high and sometimes 2 dm. in diameter, but young plants sometimes broader than high; flowering plants crowned by a slender cephalium sometimes 1 dm. high, made up of white wool and brown bristles; areoles large, very woolly when young; ribs 9 or 10; spines 8 to 13 in a cluster, all stout, more or less flattened, 2 to 3 cm. long, horn-colored or somewhat brownish; central spines usually one on young plants, but 2 or 3 on old ones; flowers rose, about 2 cm. long, 15 mm. broad when fully expanded, exserted about 12 mm. above the cephalium; outer perianth-segments obtuse, the inner acute, serrate near the tip; fruit pinkish, slender, 2 cm. long, naked; seeds black, tuberculate.

Type locality: Santo Domingo.

Distribution: Deserts of Hispaniola.

Collected at Azua, Santo Domingo, in March 1913, by J. N. Rose (No. 3832). Living material was sent both to the New York Botanical Garden and to Washington.

The Santo Domingan plant, although it has long been known, has been confused with another species. The trouble began in 1827 when Link and Otto redescribed *Cactus macracanthus* under *Melocactus* and gave the habitat of the species as Santo Domingo. Salm-Dyck, who described *Cactus macracanthus* first in 1820, did not give a definite locality. Haworth, however, in 1821 told about seeing a specimen of this species from Holland, which had been sent from South America, and which might have been sent from the Dutch Colony at Curaçao; while Salm-Dyck, in redescribing his species in 1834, gives Curaçao definitely as the locality for it. In 1837 Pfeiffer referred material from both Curaçao and Santo Domingo to this species and he has been followed by most writers since. It seems almost certain that the Santo Domingan species can not be the *Cactus macracanthus* of Salm-Dyck.

In 1839 Lemaire figured and described a species of Miquel's, *Melocactus lemarii*† (Hort. Univ. 1: 286), which was redescribed by Miquel the next year in his monograph on the genus *Melocactus*. This species came from Santo Domingo and is undoubtedly the same as the one which has been passing as *Melocactus macracanthus*.

Melocactus communis oblongus and *M. communis macrocephalus* (Link and Otto, Verh. Ver. Beförd. Gartenb. 3: 418. 1827) were assigned to Santo Domingo by Pfeiffer and, if from that island, are presumably to be referred here.

This plant is very common in the arid plain about Azua in southern Santo Domingo. It grows with other cacti and desert shrubs.

Illustrations: Hort. Univ. 1: pl. 35; Herb. Génér. Amat. II. 2: pl. 36, as *Melocactus lemarii;* Descourtilz, Fl. Med. Antill. 7: pl. 515, as *Cactier rouge main* (*fide* Urban); Nov. Act. Nat. Cur. 18: Suppl. 1. pl. 4, f. 3, as *Melocactus communis macrocephalus*.

*This name was originally published as *lemarii*, although named for Charles Lemaire.
†This is evidently the same plant which he described in 1838 as *Echinocactus lemarii*.

M. E. Eaton del. A Horn & Co

1. Top of fruiting plant of *Cactus lemairei*.
2. Top of fruiting plant of *Cactus harlowii*.
3. Crown of *Cactus harlowii*.
4. Flowering plant of *Discocactus bahiensis*.
5. Fruiting plant of *Cactus melocactoides*.

(All natural size.)

Plate XXIV, figure 1, shows the top of a fruiting plant collected by Rose, Russell, and Fitch at Azua, Santo Domingo, March 12, 1913 (No. 6324). Figure 235 is a reproduction of the plate published in L'Horticulteur Universel and cited above.

4. Cactus oreas (Miquel).

Melocactus oreas Miquel, Nov. Act. Nat. Cur. **18**: Suppl. 1. 192. 1841.
Melocactus ernesti Vaupel, Monatsschr. Kakteenk. **30**: 8. 1920.

Plant 2 to 4 cm. in diameter; cephalium 4 to 6 cm. high, composed of white wool and many soft brown hairs; ribs 10 to 12, somewhat acute, about 20 cm. high; spines 14 to 20, of which 4 to 6 are central, brown, but paler toward the tips, slender, nearly straight, subulate, much elongated, the longer ones 12 cm. long and flexible, terete; flowers pinkish; fruit clavate, 2 cm. long, bright red; seeds black, minute, 1 mm. broad, covered with low depressed tubercles.

Type locality: Bahia, Brazil.

Distribution: Dry parts of Bahia.

Common on the hills of the interior parts of Bahia, Brazil. Dr. Rose found it in Dr. Leo Zehntner's collection at Joazeiro and later collected it at Machado Portella, June 20, 1915 (No. 19729).

This plant is characterized by its greatly elongated spines, these being longer than those of any other species of the genus.

Illustrations: Karsten and Schenck, Vegetationsbilder **6**: pl. 17, as *Melocactus;* Monatsschr. Kakteenk. **30**: 8, 9, as *Melocactus ernesti.*

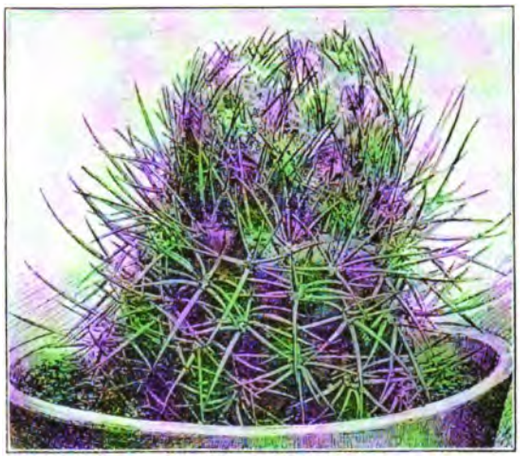


FIG. 237.—Cactus ruestii.

5. Cactus ruestii (Schumann).

Melocactus ruestii Schumann, Verzeichn. Kult. Kakt. 26. 1896.

Plants mostly globular, 5 to 15 cm. in diameter; ribs 11 to 19, rather high, separated by sharp intervals; young areoles brown-felted; spines dark brown at first, gray in age; radial spines 5 to 8, spreading or reflexed, subulate, 2.5 to 3 cm. long; central spine solitary, erect, 2.5 to 3 cm. long, subulate; cephalium a small crown of brown stiff bristles and white wool; flowers small, red.

Type locality: Honduras.

Distribution: Honduras.

It has been recently collected by F. J. Dyer in Comayagua Valley, Honduras, May 7, 1917 (No. 261) and also by George W. Ellis in rocky soil, altitude 1,500 meters, south of Comayagua, Honduras.

The species is characterized by its closely set areoles and by the very stiff bristles in the cephalium.

Illustration: Monatsschr. Kakteenk. **2**: 89, as *Melocactus brongnartii.*

Figure 237 is a reproduction of the illustration cited above.

6. Cactus maxonii Rose, Smiths. Misc. Coll. **50**: 63. 1907.

Melocactus guatemalensis Gürke and Eichlam, Monatsschr. Kakteenk. **18**: 37. 1908.
Melocactus maxonii Gürke, Monatsschr. Kakteenk. **18**: 93. 1908.

Depressed-globose, 10 to 15 cm. high; cephalium small; ribs 11 to 15, broad at base; radial spines 7 to 11, spreading or recurved, pale red or rose-colored, 1 to 1.5 cm. long; central spine usually solitary, porrect or ascending; flowers rose-colored; fruit clavate; seeds black, shining.

Type locality: Near El Rancho, Guatemala.

Distribution: Guatemala.

Soon after this species was described E. von Tuerckheim, who had spent many years in Guatemala, wrote that the plant was an old acquaintance and that some 20 years before he had sent several hundred from Salama to a European dealer.

The habitat of this plant is various; Mr. Maxon reported finding it on barren stony hillsides while Charles C. Deam found it in flat exposed rocky places and sometimes in open woods. The plants grow singly or in pairs at an altitude of about 300 meters.

Illustrations: Stand. Cycl. Hort. Bailey **2**: 612. f. 729, as melon-cactus; Monatsschr. Kakteenk. **23**: 179; Möllers Deutsche Gärt. Zeit. **25**: 477. f. 11, No. 2, 9, as *Melocactus maxonii;* Smiths. Misc. Coll. **50**: pl. 6; Ann. Rep. Smiths. Inst. **1908**: pl. 2, f. 2.

Figure 239 is from a photograph of the type plant.

7. Cactus salvador (Murillo).

Melocactus salvador Murillo, Circular [about 1897].

Simple, globose, 3 to 4 dm. in diameter; ribs 13; radial spines 8, somewhat recurved; central spines 1 to 3, longer and stouter than the radials, those near the center of the plant nearly erect, those on the side somewhat curved downward; cephalium 8 cm. in diameter; flowers rose-pink; seeds black.

FIG. 238.—Cactus melocactoides.

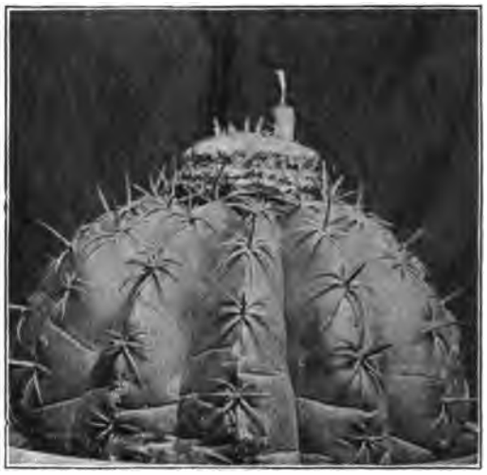


FIG. 239.—Cactus maxonii.

Type locality: Not cited.

Distribution: High mountains above Jalapa, Vera Cruz.

This plant was first described in a circular issued by Louis Murillo of Jalapa about 1897. It was offered for sale in March 1898 in the Cactus Journal (p. 28) and in several subsequent numbers. It was later described by Walton (Cact. Journ. **2**: 103. 1899) and is referred to incidentally in the Monatsschrift für Kakteenkunde (9: 178; 18: 61, 62, 64, 93; 19: 81), sometimes as *M. san-salvador*, and is also incidentally mentioned by Schumann (Gesamtb. Kakteen 454. 1898).

Dr. Rose in 1912 found four photographs of the plant at Kew which had been sent by Professor Murillo. Murillo's original description was accompanied by an illustration of four potted plants; as his description is accessible to only a few it is reproduced here:

"MELOCACTUS SALVADOR.

"A new and very scarce Cactus. Discovered by Louis Murillo.—Jalapa, Mexico.

"This is a new and beautiful plant, of spherical form, with 13 symmetrical furrows, which are deeply marked and covered with long and conic spines that are arranged in the shape of a crown, 8 radial, 1 to 3 central, the latter much longer and all slightly curved. It reaches a diameter of from

30 to 40 centimeters when full grown. The cephalium has a diameter of about 8 cm. and a height of 3 inches and is formed by clusters of short spines strongly set together and which are of a reddish hue. In the middle of the clusters beautiful flowers sprout out and are followed by purplish fruit that give the whole plant a fair and elegant aspect. This *Melocactus* is found in the fissures of lofty, perpendicular mountain passes, but in very limited numbers, and in a region not exceeding a square mile in extent. Therefore it is impossible for me to collect large numbers of the same.

"Cactus lovers have now an opportunity to enrich their collections with this new specimen which has already excited the cordial admiration of amateurs both in the United States and Germany."

We wrote to Mr. S. A. Skan, of the Kew Library, regarding this publication and name and he replied as follows:

"I have made an effort to ascertain the date of its publication but regret that I have not obtained any definite information. The name *Melocactus salvador* has not been taken up in any of the supplements to the Index Kewensis. In the Kew Hand-List of Tender Dicotyledons (1899) there is '*M* [*elocactus*] *salvatoris*, Hort. Mexico.' I supposed that to be a mistake for *M. salvador* and communicated with Mr. Watson about it. He tells me that a plant named *M. salvatoris* was purchased from Prof. L. Murillo in 1898. It is not now at Kew."

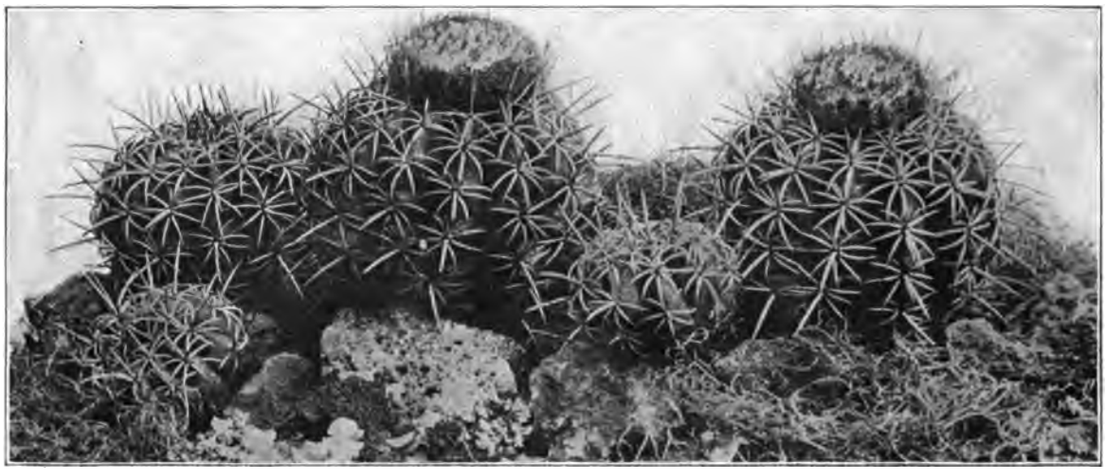


FIG. 240.—Cactus salvador.

It must be different from *Melocactus curvispinus* (Pfeiffer, Enum. Cact. 46. 1837) also from Mexico, a species which we know only from description. It is described as globose, 10 cm. high, 7.5 cm. in diameter, depressed; ribs 10 to 12; areoles large, round, white-velvety; radial spines 7, curved, brownish or white, 12 to 16 mm. long; central spines 2, erect, 2.5 cm. long, blackish.

Another species, *Melocactus delessertianus* Lemaire (Hort. Univ. 1: 225. 1839), has been described from Mexico which may or may not be this plant. It was described as slightly depressed, about 10 cm. high; ribs 12 to 15; radial spines 8 or 9; central spines 2; flowers and fruit unknown.

Figure 240 is reproduced from a photograph, taken by Louis Murillo, now on deposit in the Library at Kew, a copy of which was sent us by the Director, Captain Arthur W. Hill.

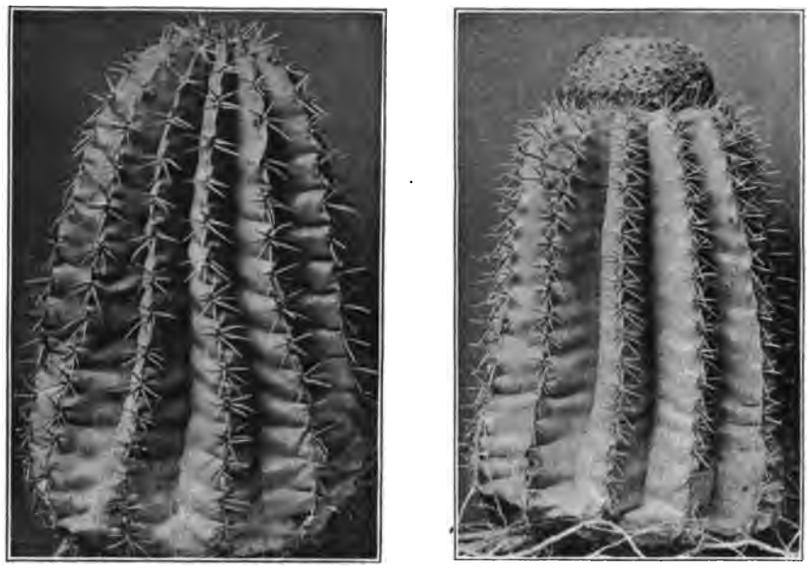
8. Cactus broadwayi sp. nov.

Plant a little longer than thick, 1 to 2 dm. high, yellowish green; ribs 14 to 18, sometimes branching above, rather low, 1 to 1.5 cm. high, 1 to 2 cm. broad at base, rounded, separated from one another by acute intervals; areoles small, depressed, 1 cm. apart; spines horn-colored, but often with brownish tips or some, especially the central ones, brown throughout, at least when young; radial spines 8 to 10, 1 to 1.5 cm. long, more or less curved inwards; central spines usually one,

sometimes 2 or 3, a little stouter than the radials; cephalium small, 6 to 7 cm. broad at base, 2 to 3 cm. high, made up of soft brown bristles and white wool; flowers small, purplish; fruit clavate, 2.5 cm. long, purple; seeds black.

Collected on Tobago Island, West Indies, by W. R. Broadway in 1914 and through W. G. Freeman from the same island in 1921, type; also obtained on Grenada, British West Indies, by R. O. Williams in 1921.

Figure 231 is from a photograph of the plant sent by W. G. Freeman from Tobago; figure 236 is from a photograph of the plant sent by R. O. Williams from Grenada.



FIGS. 241 and 242.—Cactus intortus.

9. Cactus intortus Miller, Gard. Dict. ed. 8. No. 2. 1768.

Echinocactus intortus De Candolle, Prodr. 3: 462. 1828.
Melocactus communis atrosanguineus Link and Otto, Verh. Ver. Beförd. Gartenb. 6: 430. 1830.
Melocactus communis ovatus Hooker in Curtis's Bot. Mag. 58: pl. 3090. 1831.
*Melocactus communis viridis** Pfeiffer, Enum. Cact. 42. 1837.
Melocactus communis grengeli Pfeiffer, Enum. Cact. 43. 1837.
Melocactus communis havannensis Pfeiffer, Enum. Cact. 43. 1837.
Melocactus atrosanguineus Pfeiffer, Enum. Cact. 44. 1837.
Melocactus grengelii Forbes, Journ. Hort. Tour Germ. 151. 1837.
Echinocactus xanthacanthus Miquel, Linnaea 11: 155. 1837.
Melocactus macrocanthus Miquel, Linnaea 11: 157. 1837. Not Link and Otto, 1827.
Melocactus miquelli Lehmann, Del. Sem. Hort. Hamb. 1838.
Melocactus havannensis Miquel, Nov. Act. Nat. Cur. 18: Suppl. 1. 144. 1841.
Melocactus wendlandii Miquel, Nov. Act. Nat. Cur. 18: Suppl. 1. 146. 1841.
Melocactus dichroacanthus Miquel, Nov. Act. Nat. Cur. 18: Suppl. 1. 147. 1841.
Melocactus xanthacanthus Miquel, Nov. Act. Nat. Cur. 18: Suppl. 1. 169. 1841.
Melocactus macracanthoides Miquel, Nov. Act. Nat. Cur. 18: Suppl. 1. 173. 1841.
Melocactus schlumbergerianus Lemaire, Illustr. Hort. 8: Misc. 32. 1861.
Melocactus portoricensis Suringar, Versl. Med. Akad. Wetensch. III. 9: 408. 1891.
Melocactus bradleyi Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 5^3: 23. 1896.
Melocactus hookeri Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 5^3: 31. 1896.
Melocactus eustachianus Suringar, Verh. Kon. Akad. Wetensch. II. 5^3: 37. 1896.
Melocactus linkii Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 5^3: 39. 1896.
Melocactus croceus Suringar, Verh. Kon. Akad. Wetensch. Amst. II. 5^3: 40. 1896.
Melocactus communis bradleyi Monatsschr. Kakteenk. 6: 142. 1896.
Melocactus communis croceus Monatsschr. Kakteenk. 6: 142. 1896.
Melocactus communis eustachianus Monatsschr. Kakteenk. 6: 142. 1896.
Melocactus communis hookeri Monatsschr. Kakteenk 6: 142. 1896.
Melocactus intortus Urban, Repert. Sp. Nov. Fedde 16: 35. 1919.

*This name first appeared in 1830 (Link and Otto, Verh. Ver. Beförd. Gartenb. 6: 430) and was assigned to a plant of Curaçao, but was without description.

Globose to cylindric, sometimes nearly a meter high; cephalium cylindric, sometimes nearly as long as the plant-body, made up of white wool and soft brown bristles; ribs 14 to 20, thick, large, 2 to 3 cm. high; spines 10 to 15, stout, yellow to brown, 2 to 7 cm. long; flowers pinkish, 1.5 to 2 cm. long; outer perianth-segments acutish or obtuse and mucronulate; inner perianth-segments acute; stigma-lobes 6 or 7, apiculate; fruit oblong to broadly clavate, 2 to 2.5 cm. long; seeds dull black, strongly tubercled, especially at the distal end.

Type locality: Antigua, West Indies.

Distribution: Southern Bahamas, Porto Rico, Virgin Islands, St. Christopher, Antigua, Montserrat, and Dominica.

Urban, who has followed us in restoring Miller's old specific name *intortus*, although using it under *Melocactus*, has applied the name to the Hispaniolan plant while, as a matter of fact, Miller's plant came from Antigua and represents a very different species.

The plant is abundant along and near the coast in southwestern Porto Rico and grows also on the Porto Rican Islands Culebra, Vieques, Mona, and Desecheo; a headland near Cabo Rojo, Punta Melones, has taken its name from this cactus. On the islands Mona and Desecheo in the Mona Passage a race with elongated slender spines exists; and through the Virgin Islands, east to Anegada, the species shows much variability in its armament. It grows on several islands in the southern part of the Bahamas, north to Acklin's Island and Long Island, called Turk's cap or Turk's head here as in the Lesser Antilles; the Turk's Islands have taken their name from this plant which appears on their postage stamps.

FIG. 243.—Cactus intortus.

Illustrations: Bradley, Hist. Succ. Pl. ed. 2. pl. 32, as *Echinomelocactus;* Journ. N. Y. Bot. Gard. **6**: 7. f. 3; **9**: 46. f. 11, as *Melocactus* sp.; Curtis's Bot. Mag. **58**: pl. 3090, as *Melocactus communis ovatus;* Monatsschr. Kakteenk. **6**: 87, 135; **26**: 115; Schumann, Gesamtb. Kakteen f. 6; Zool. Soc. Bull. **22**: 1466; Dict. Gard. Nicholson **2**: 347. f. 539, as *Melocactus communis;* Dict. Gard. Nicholson **4**: 568. f. 42; Suppl. 530. f. 568; Nov. Act. Nat. Cur **18**: Suppl. 1. pl. 7; Förster, Handb. Cact. ed. 2. 432. f. 47; Watson Cact. Cult. 141. f. 55., as *Melocactus miquelii;* Nov. Act. Nat. Cur. **18**: Suppl. 1. pl. 11, as *Melocactus macracanthoides;* Bradley, Pl. Succ. pl. 32, as *Echinomelocactus;* Linnaea **11**: pl. 4, as *Echinocactus xanthacanthus;* Mus. Bot. Leide **3**: pl. 1, 2, 4, A, as *Melocactus eustachianus;* Mus. Bot. Leide **3**: pl. 3, 4 E, as *Melocactus portoricensis;* Wendland, Coll. Pl. Succ. **1**: pl. 5, *fide* Miquel; Verh. Kon. Akad. Wetensch. Amst. II. 5^3: pl. 2, f. 4, 4a, 4b, 6; Mus. Bot. Leide **3**: pl. 4, B, 12, 13, 19, as *Melocactus linkii;* Mus. Bot. Leide **3**: pl. 4, C, as *Melocactus linkii* (form) Mus. Bot. Leide **3**: pl. 11, as *Melocactus linkii* (seedlings); Verh. Kon. Akad. Wetensch. Amst. II. 5^3: pl. 2, f. 5 to 5d; Mus. Bot. Leide **3**: pl. 4, D, 12, 20, as *Melocactus croceus;* Mus. Bot. Leide **3**: pl. 11 (seedlings); Mus. Bot. Leide **3**: pl. 4, C, as *Melocactus linkii trispinus.*

The following illustrations, more or less diagrammatic, while generally showing the characters of this genus remarkably well, do not bring out the specific differences and we have been unable to distribute them. It seems desirable to make a record of them here:

Krook, Handb. Cact. 57; Rev. Hort. Belge 40: after 186; Descourtilz, Fl. Med. Antilles ed. 2. 7: pl. 515, as Cactier rouge; Dict. Gard. Nicholson 2: 347. f. 539, as *Melocactus communis;* Remark, Kakteenfreund 18, as pertinato.

Figure 241 shows a barren plant and figure 242 flowering plants, both sent from Turk's Island, British West Indies, through the courtesy of the Director of the New York Aquarium, July 1916; figure 243 shows a single flowering plant from Mona Island, off Porto Rico, photographed by Frank E. Lutz in 1914; the other smaller plant is the snowy cactus.

10. Cactus harlowii Britton and Rose, Torreya 12: 16. 1912.

Melocactus harlowii Vaupel, Monatsschr. Kakteenk. 22: 66. 1912.

Plants usually solitary, light green, rather slender, 2.5 dm. high; ribs 12, narrow; areoles closely set, usually less than 1 cm. apart; radial spines about 12, slender, slightly spreading, 1 to 2 cm. long, reddish, becoming straw-colored in age; central spines usually 4, similar to the radial, but usually a little stouter and longer; cephalium small; flowers small, 2 cm. long, deep rose-red; fruit deep red, obovoid, 2 cm. long; seeds black, shining.

Type locality: Coastal cliffs, Guantánamo Bay, Oriente, Cuba.

Distribution: Eastern Cuba.

This seems to be the only species of this genus in Cuba, although *Melocactus havannensis* was based upon a plant from Cuba, now supposed, however, to have been a garden plant. In the Sauvalle Herbarium there is, however, a fragment of a plant so named but its exact locality we do not know.

The plant is locally abundant on coastal cliffs from Point Maysi to Guantánamo and grows also on river cliffs near Ensenada de Mora, farther west. Dr. Felipe Garcia Cañizares, Director of the Havana Botanical Garden, has sent us fine photographs of the plant from Point Maysi. It was recorded by Grisebach and by Sauvalle as *Melocactus communis;* its Cuban name is cardon.

The specific name was given in honor of Captain Charles Henry Harlow, U. S. N., Commandant of the Guantánamo Naval Station at the time Dr. Britton studied the flora of that reservation in 1909.

Illustration: Cañizares, Jardin Bot. Inst. Habana 61.

Of plate XXIV, figure 2 shows a fruiting plant and figure 3 shows the crown of the plant in flower and fruit, all from the type collection.

11. Cactus amoenus Hoffmannsegg, Preiss. Verz. ed. 7. 22. 1833.

Melocactus amoenus Pfeiffer, Enum. Cact. 43. 1837.

Simple, 2 dm. high; ribs 10 to 15, 2 cm. high; radial spines 9, spreading, more or less curved, 2 cm. long or less; central spine solitary, 2.5 cm. long or less; cephalium 7 to 8 cm. broad, 2 to 3 cm. high; flowers small, red.

Type locality: Colombia.

Distribution: Coast of northern Colombia.

We are referring here plants collected on the low dry hills near Santa Marta, Colombia. We have seen the following specimens: H. H. Smith, 1898 (No. 2611), Sinclair, 1914, H. M. Curran, 1916 (No. 358) and Pennell, 1918.

Melocactus communis joerdensii Otto (Pfeiffer, Enum. Cact. 43. 1837) and *M. communis joerdensis* (Förster, Handb. Cact. ed. 2. 425. 1885) are only names. If this variety comes from Venezuela as Rümpler suggested the name would be referred to *Cactus caesius.*

12. Cactus obtusipetalus (Lemaire).

Melocactus obtusipetalus Lemaire, Cact. Aliq. Nov. 11. 1838.
Melocactus crassicostatus Lemaire, Cact. Aliq. Nov. 13. 1838.
Melocactus obtusipetalus crassicostatus Lemaire in Miquel, Nov. Act. Nat. Cur. 18: Suppl. 1. 136. 1841.

Ribs 10, vertical, stout, 5 cm. high, somewhat repand, acute, somewhat inflated at the areoles; areoles 5 cm. apart; spines up to 11, about 2.5 cm. long, rigid; radial spines light brown with transverse striations; lateral spines more or less recurved or reflexed; cephalium small; flowers rose-colored, twice the size of those of *Cactus meloctacus;* perianth-segments oblong, rounded or obtuse at apex; style white; stigma-lobes 6.

Type locality: Santa Fé de Bogotá, Colombia.

Distribution: Colombia.

The probabilities are that this species is not native at Bogotá but that it was in cultivation there, specimens having been sent from lower altitudes. Mr. Pittier found a species at Venticas del Dagua, Cauca, in the western cordillera of Colombia, altitude 1,000 meters, which we are disposed to refer here. Dr. F. W. Pennell and Mr. E. P. Killip sent us from this same locality in June 1922 (No. 5415) a single living plant. This specimen is over 2 dm. in diameter and has 14 ribs; the radial spines are usually 8, spreading or a little curved backward, 2 cm. long or more; in addition to these spines there are 2 or 3 short ones (3 to 7 mm. long) from the upper part of the spine-areoles which make the upper stout radial appear sub-central; in addition to these there is one stout central spine, porrect or ascending, 2 to 2.5 cm. long; the spines were probably brown at first, but in age are pale, almost gray. The cephalium is very small.

Dr. Rusby collected in 1917 specimens of this or a related species on an arid plain near Cabrello on the Cabrero River, Colombia. We have studied a fragmentary specimen collected by J. F. Holton at Opia, Colombia, in 1852 (No. 728), preserved in the Torrey Herbarium, which has only 6 spines at each areole and these all radial.

13. Cactus caesius (Wendland) Britton and Rose, Bull. Dept. Agr. Trinidad **19**: 86. 1921.

Melocactus caesius Wendland in Miquel, Nov. Act. Nat. Cur. **18**: Suppl. 1. 184. 1841.
Melocactus griseus Wendland in Miquel, Nov. Act. Nat. Cur. **18**: Suppl. 1. 185. 1841.
Melocactus cephalenoplus Lemaire, Hort. Univ. **2**: 128. 1841.
Melocactus caesius griseus Förster, Handb. Cact. 263. 1846.
Melocactus humilis Suringar, Versl. Med. Akad. Wetensch. III. **6**: 459. 1889.

Plants globose, depressed, or narrowed above, 1 to 2 dm. high; ribs 10 to 15, prominent, acute, 2 cm. high; areoles circular, white-woolly when young, 2 to 3 cm. apart; radial spines about 8, spreading, horn-colored; central spines similar to the radials, about 2 cm. long; cephalium broad and low, composed of white wool and brown bristles, broader than the apex of the plant body; fruit obovoid, wine-colored, up to 3 cm. long, 1 to 1.5 cm. thick.

Type locality: La Guayra, Venezuela.

Distribution: Coast of Venezuela and Colombia; Patos Island, Trinidad; and perhaps Dutch Guiana.

This species has recently been collected by Henry Pittier at the type locality. His specimens show a variation in the number of ribs of from 10 to 14 and probably represent the two forms which Wendland described as different species. Mr. Pittier's plants show considerable variation but hardly seem to warrant the recognition of two species.

FIG. 244.—Cactus caesius.

In September 1920 Dr. Gerold Stahel of Paramaribo, Surinam, sent us a photograph of a group of *Cactus* plants which we tentatively refer here. The living specimens which he collected for us were lost a week after he had collected them through the indifference of his camp helpers. According to Dr. Stahel, the plants were found near the big Raleigh Falls on the Upper Coppename River. They grow on the entirely nude rocks of the Volkberg and are usually found solitary.

Illustrations: Blühende Kakteen **2**: pl. 92, as *Melocactus caesius;* Mus. Bot. Leide 3: pl. 5, 10, A; Versl. Kon. Akad. Wetensch. Amst. 6: opp. p. 192. pl. [4]; Gartenflora **46**: pl. 1439; **52**: 61. f. 8, as *Melocactus humilis.*

Figure 245 shows the Surinam plant growing on a mass of rock on the nearly bare summit of a hill; figure 246 is from a photograph of a plant obtained by Mr. Pittier near La Guayra in 1913; figure 247 was also obtained by Mr. Pittier at Barquisimeto in 1913; figure 244 shows a plant of Patos Island, Trinidad, taken by Professor Tracy E. Hazen in 1921.

14. Cactus townsendii nom. nov.

Melocactus peruvianus Vaupel, Bot. Jahrb. Engler **50**: Beibl. 111: 28. 1913. Not *Cactus peruvianus* Linnaeus, 1753.

Usually solitary, but sometimes several plants together forming a clump, nearly globular, 1 to 1.5 dm. in diameter; ribs usually 12 or 13, prominent; areoles 1 to 1.5 cm. apart, somewhat elliptic; spines usually 8 or 9, brown or brownish, long and spreading or recurved; central spine, if present, porrect, sometimes 4 cm. long; cephalium usually 6 to 8 cm. high, composed of reddish brown bristles and white wool; flowers pinkish, 2.5 cm. long, persistent on the ovary; fruit red, narrowly clavate, 12 to 16 mm. long; seeds black, roughened.

FIG. 245.—Cactus caesius

Type locality: Chosica, on the Lima and Oroya Railroad, central Peru.

Distribution: Mountains of western central Peru, from above Lima to above Eten.

Some years ago Dr. C. H. Tyler Townsend sent us a specimen of *Cactus* from Peru which we studied and described, but before our description could be printed Dr. F. Vaupel published his *Melocactus peruvianus.* His specific name can not be used under *Cactus* and we have, therefore, substituted the one which we first gave the plant.

This is the most southern species of the genus *Cactus* on the west coast of America. Although described as a distinct species only in 1913, the presence of a so-called *Melocactus* has been known in Peru for a long time; various travelers, including Roezl (1874), mention such a plant.

15. Cactus bahiensis sp. nov.

Dull green, 1 dm. high, 1.5 dm. in diameter; ribs 10 to 12, broad at base, 2.5 cm. high, each bearing 6 or 7 areoles; spines all brown; radial spines about 10, the longest 2.5 cm. long; central spines usually 4, the longest 3.5 cm. long; cephalium low, with many dark brown bristles; flowers pinkish; fruit red, clavate, 1.5 cm. long; seed black, shining, 1 mm. in diameter.

Collected by Rose and Russell near Machado Portella, Bahia, Brazil, in 1915 (No. 19935). The plant was found only at a single locality in central Bahia, but it was there

very common and will doubtless be obtained from other localities. It grows on the tops of nearly barren hills and is very different from *Cactus zehntneri*, from northern Bahia.

16. Cactus melocactoides Hoffmannsegg, Verz. Pfl. Nachtr. 3: 24. 1826.

Melocactus melocactoides De Candolle, Prodr. 3: 461. 1828.
Melocactus violaceus Pfeiffer, Allg. Gartenz. 3: 313. 1835.
Melocactus goniodacanthus Lemaire, Cact. Aliq. Nov. 11. 1838.
Melocactus pentacentrus Lemaire, Cact. Gen. Nov. Sp. 108. 1839.
Melocactus depressus Hooker in Curtis's Bot. Mag. 65: pl. 3691. 1839. Not Salm-Dyck, 1828.

Somewhat depressed, 8 cm. high by 15 cm. broad, light green; ribs usually 10* (rarely 9 or 11), broad, obtuse, a little "crenate"; areoles only 5 or 6 on a rib; radial spines 5 to 8, sometimes a little curved, angled, usually pale brown, in age grayish; central cephalium (so far as known) small; flowers pinkish; perianth-segments with toothed margins; fruit white to very pale rose-color, oblong or club-shaped, 1.5 to 2.5 cm. long; seeds black, reticulated.

FIGS. 246 and 247.—Cactus caesius.

Type locality: Brazil, but no definite locality cited.

Distribution: Coast of Brazil, especially Rio de Janeiro, Bahia, and Pernambuco.

Dr. Rose collected a plant along the coast of Bahia (No. 19691) which he would refer here. A somewhat similar plant, but smaller, was collected by him at Cabo Frio (No. 20698) which we have tentatively referred here. Schumann, however, kept the Bahia and Rio de Janeiro plants distinct, referring the plant from Bahia to *Melocactus depressus* and the one from Rio de Janeiro to *M. violaceus*.

All the Brazilian species of this genus are called cabeça de frade on account of the cephalium; this plant is sold for use in the preparation of some household remedy.

Melocactus gardenerianus Booth was given by Förster (Handb. Cact. 277. 1846) as a synonym of *M. depressus* Hooker. The name, *M. depressus* Salm-Dyck, was given by De Candolle (Prodr. 3: 463. 1828) as a synonym of *Echinocactus depressus*. *M. parthoni* (Miquel, Nov. Act. Nat. Cur. 18: Suppl. 1. 190. 1841) was given as a synonym of *M. violaceus*. Schumann also refers it here, giving the name to Cels (Cat. et. Hortul.).

Illustrations: Curtis's Bot. Mag. 65: pl. 3691; Nov. Act. Nat. Cur. 18: Suppl. 1. pl. 2, f. 1, c, d; pl. 4, f. 1; Monatsschr. Kakteenk. 32: 39, as *Melocactus depressus;* Engler and Prantl, Pflanzenfam. 3^{6a}: f. 65, A; Martius, Fl. Bras. 4^{2}: pl. 48, as *Melocactus violaceus*.

*Schumann describes *M. goniodacanthus* (he spells it *goniacanthus*) with 16 to 20 ribs.

Plate XXIV, figure 5, shows a plant collected by Rose and Russell at Cabo Frio, August 8, 1915 (No. 20698). Figure 238 is reproduced from the first illustration cited above.

17. Cactus zehntneri sp. nov.

Often cylindric, sometimes 2 to 3 dm. high; ribs 12 to 15, rather thin, acutish; radial spines terete, stout, dark brown, more or less incurved, 2.5 cm. long or less; central spine one, similar to the radials, erect or ascending; flowers pinkish; fruit red.

Very common on the flats near Joazeiro, Bahia, where it was collected by Dr. Rose and P. G. Russell in 1915 (No. 19728).

These plants grow in the open on the flats in the semiarid part of Bahia, often associated with *Cephalocereus gounellei* and other cacti.

Illustration: Vegetationsbilder **6:** pl. 15, as *Melocactus* sp.

Figure 248 is from a photograph of the type plant.

FIG. 248.—Cactus zehntneri.

FIG. 249.—Cactus sp.

18. Cactus neryi (Schumann).

Melocactus neryi Schumann, Monatsschr. Kakteenk. 11: 168. 1901.

More or less depressed, 10 to 11 cm. high, 13 to 14 cm. in diameter, crowned by a small cephalium a little broader than high; ribs 10, broad and low; radial spines 7 to 9, terete, spreading outward, 2.5 cm. long; flowers 2.2 cm. long; stigma-lobes greenish; fruit clavate, red.

Type locality: Aracá-Fluss, Brazil.

Distribution: State of Amazonas, Brazil.

The plant is known to us only from description and illustrations.

The specific name for this plant was originally spelled *negryi* instead of *neryi*. The plant was named for Herr Nery, at one time Governor of Amazonas, Brazil. Schumann describes the species and cites himself as the author of the name in the original place of publication while in his Keys of the Monograph he credits the name to Witt.

Illustrations: Monatsschr. Kakteenk. **11:** 169; Schumann, Gesamtb. Kakteen Nachtr. 130. f. 32, as *Melocactus neryi.*

Figure 250 is a reproduction of the original illustration cited above.

CACTUS sp.

Plant small, globose, 1 dm. in diameter; ribs about 11 to 13, rounded, low; spines usually 10 to 12, subulate, more or less recurved; central spine 1 or sometimes 2; crown 10 to 12 cm. in diameter; flowers small; fruit small.

We know this only from a barren plant but it is evidently of this genus.

A living plant was sent to Dr. Rose by Professor C. Conzatti in October 1913 (No. 151*a*), from Salina Cruz, Oaxaca, and it has been reported by Dr. C. A. Purpus from San Geronimo. Dr. Purpus has written to us as follows:

"The *Melocactus* from San Geronimo is indeed a most interesting and remarkable cactus. When I saw the cactus, I mean to say without a crown, very few specimens ever having one, I thought it was an *Echinocactus*, but of course it is undoubtedly a small *Melocactus*, the smallest which I ever saw. Later I found some specimens with a woolly crown and with it flower and fruit. The flower and fruit resemble flower and fruit of a *Mammillaria*."

Here may belong *Melocactus curvispinus* Pfeiffer (Enum. Cact. 46. 1837) and *M. delessertianus* Lemaire (Hort. Univ. 1: 225. 1839).

Figure 249 shows a barren plant by C. Conzatti, referred to above.

FIG. 250.—Cactus neryi.

DESCRIBED SPECIES, PERHAPS OF THIS GENUS.

CACTUS HEPTAGONUS Linnaeus, Sp. Pl. 466. 1753.

Cereus heptagonus Miller, Gard. Dict. ed. 8. No. 6. 1768.

The name has not been definitely associated with any known cactus by authors subsequent to Miller. Linnaeus indicates that the plant was of American origin and states (Hort. Cliff. 161) that "it is exactly ovate, with 7 angles deeply sculptured; some say they have seen the same thing 1 or 2 feet high, but our plant did not change its shape in growth." Miller's account of it is not more satisfactory; he indicates that he received it, among other kinds of *Cereus* from the British Islands of America and that it has 7 or 8 ribs and several very long white spines. He also says: "Upright, thickest torch thistle, having many angles, several very long white spines and yellow down." There may be doubt whether Miller's plant was the same as that of Linnaeus.

Cactus heterogonus (De Candolle, Prodr. 3: 470. 1828) is a misspelling for *C. heptagonus*.

CACTUS PARVISPINUS Haworth, Suppl. Pl. Succ. 73. 1819.

Echinocactus parvispinus De Candolle, Prodr. 3: 463. 1828.

Ribs about 12; spines 6 to 8 mm. long, white with brownish tips; flowers unknown.

This plant was in cultivation in England in 1815 and is said to have come from the West Indies. It was probably a young plant and is doubtless of this alliance. *Melocactus parvispinus* Haworth (De Candolle, Prodr. 3: 463. 1828) was given only as a synonym.

MELOCACTUS EXCAVATUS Forbes, Journ. Hort. Tour Germ. 151. 1837.

This plant is said to come from Mexico and is probably not of this relationship. Forbes briefly described it as hollow, crowned with 13 ribs; radial spines 7 or 8; central spine solitary, reddish yellow.

MELOCACTUS HYSTRIX Parmentier in Miquel, Nov. Act. Nat. Cur. **18**: Suppl. 1. 138. 1841.

The origin of this plant is unknown and it has never been definitely referred to any of the described species.

MELOCACTUS MONVILLEANUS Miquel, Nov. Act. Nat. Cur. **18**: Suppl. 1. 133. pl. 5. 1841.

This species can not be identified and its origin is unknown. The illustration shows a barren plant which does not suggest any of the species of *Cactus* known to us, but rather some stubby *Cereus* relative such as *Cereus lormata*.

MELOCACTUS LEOPOLDII Gard. Chron. II. 5: 603. 1876.

The only information regarding this plant which we have is an account of an International Exhibition at Brussels in 1876 in which it was awarded a prize with this comment: The third prize was given to M. de Smet for *Melocactus leopoldii*, a globular plant with very numerous spiñes of reddish hue, paler at base, the largest ones 2.5 inches long.

MELOCACTUS LEUCASTER Hoffmannsegg, Preiss. Ver. ed. 7. 22. 1833.

This species is described as having short white spines. We do not know it nor have we seen the original description. Walpers thought it was a variety of *Melocactus communis*.

MELOCACTUS OCTOGONUS Forbes, Journ. Hort. Tour Germ. 151. 1837.

This plant came from Mexico in 1834 and can not now be definitely identified but it probably is not of this genus. The original description says it has 8 remote ribs and 8 to 10 brownish yellow spines. The name occurs also in Sweet's Hortus Britannicus (ed. 3. 282. 1839). It is probably different from *Cactus octogonus* which Steudel refers as a synonym of *Cereus hexagonus*.

Cactus aculeatissimus Zeph (Steudel, Nom. 131. 1821) is only a name.

Cactus aurantiiformis Thiery, catalogued in both editions of Steudel (Nom. 131. 1821; ed. 2. 1: 245. 1840) and also catalogued by the Index Kewensis, was without synonymy and so far as we know has never been described.

Cactus luteus Thiery (Steudel, Nom. 132. 1821; ed. 2. 1: 246. 1840) is only a name which Steudel himself questioned.

Cactus mensarum Thiery (Steudel, Nom. ed. 2. 1: 246. 1840) is only a name.

Cactus proteiformis Desfontaines (Tabl. Bot. ed. 3. 276. 1829; *Cereus proteiformis* Steudel, Nom. ed. 2. 1: 246. 1840) can not be identified.

Cactus pseudotuna (Steudel, Nom. ed. 2. 1: 246. 1840) was said to be *Opuntia pseudotuna*, a very doubtful plant.

Cactus sylvestris Thiery (Steudel, Nom. 132. 1821; ed. 2. 1: 246. 1840) is only a name.

Cactus trichotomus Tenore (Steudel, Nom. ed. 2. 1: 246. 1840) is only a name.

Cactus verticillatus Brotero (Heynhold, Nom. 2: 103. 1846) is only a name.

Melocactus atrovirens Hortus (Förster, Handb. Cact. 279. 1846) is only a name.

Melocactus coronatus Cels (Förster, Handb. Cact. 279. 1846) is only a name.

Melocactus ferox Pfeiffer (Förster, Handb. Cact. 519. 1846) which was supposed to come from southern Brazil we do not know. With this is also referred *Echinocactus armatus* Salm-Dyck (Pfeiffer, Enum. Cact. 61. 1837) and *Echinocactus spina-christi* Zuccarini (Pfeiffer, Enum. Cact. 59. 1837) and to the latter Pfeiffer refers *Echinocactus fischeri* as a synonym and Förster gives *Melocactus spina-christi* Cels (Handb. Cact. 279. 1846) as simply a name.

Melocactus fluminensis Poselger (Monatsschr. Kakteenk. 2: 50. 1892; 3: 68. 1893) is only a name.

Melocactus hookerianus Forbes (Förster, Handb. Cact. 279. 1846) is only a name.

Melocactus nigro-tomentosus (Monatsschr. Kakteenk. 3: 1. 1893), *Melocactus lobelii* (Monatsschr. Kakteenk. 6: 142. 1896), illustrated (Verh. Kon. Akad. Wetensch. II. 5^3: pl. 1. f. 1, 1, a, 1, b), *M. communiformis* (Monatsschr. Kakteenk. 8: 31. 1898) and *Melocactus repens* (Monatsschr. Kakteenk. 18: 167. 1908) seem never to have been described.

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